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ABSTRACT

Twenty-three workshop participants representing 12 far eastern countries and Iran examined the range and scope of existing improvised materials in participating countries, and prepared a comprehensive list of educational materials which are being used and which could be used in Asian countries. They also considered trends, problems, and issues in the development and utilization of low-cost educational materials; formulated guidelines and strategies for designing, producing, and evaluating such materials; and developed exemplar materials. Each participant then prepared a brief write-up on measures to undertake in his/her national setting in order to expand and reorient efforts relating to the development of low-cost educational materials. The appendices include (1) the workshop agenda; (2) a list of the participants; (3) a list of the workshop officers, committees, task forces, and working groups; (4) the inaugural address; (5) an overview of the role of the workshop; and (6) a list of low-cost and simple educational materials. Representatives of the two sponsoring organizations--the Malaysian Ministry of Education and Unesco--attended the workshop as observers. (Author/BK)

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APEID
ASIAN PROGRAMME OF EDUCATIONAL INNOVATION FOR DEVELOPMENT

Design, development and evaluation of low-cost educational materials

Report of a Regional Workshop
Kuala Lumpur, 5-15 December 1977

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The APEID Regional Workshop in Educational Technology with Special Reference to Development of Low-cost Educational Materials

was jointly organized by:

Curriculum Development Centre, Ministry of Education, Malaysia

and

Asian Centre of Educational Innovation for Development
Unesco, Bangkok

The *Asian Programme of Educational Innovation for Development (APEID)*, initiated on the recommendation of the Third Regional Conference of Ministers of Education and Those Responsible for Economic Planning in Asia (May–June 1971, Singapore) and the authorization of the General Conference of Unesco at its seventeenth session (Paris, 1972), aims at stimulating and encouraging educational innovations linked to the problems of national development in the Asian region.

All projects and activities within the framework of APEID are designed, developed and implemented co-operatively by the participating Member States through their national centres which have been associated by them for this purpose with APEID.

The 19 Member States in Asia and Oceania which have joined APEID are: Afghanistan, Australia, Bangladesh, Democratic Kampuchea, India, Indonesia, Iran, Japan, Republic of Korea, Lao People's Democratic Republic, Malaysia, Nepal, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand and Socialist Republic of Viet Nam.

The Asian Centre of Educational Innovation for Development (ACEID) has been established at the Unesco Regional Office for Education in Asia and Oceania in Bangkok to co-ordinate the activities under APEID and to assist the associated national institutions in carrying them out.

The aims of APEID are:

- to stimulate efforts of the Member States to improve the quality of life of the people through creating and strengthening national capabilities for the development and implementation of innovations in education, both formal and non-formal;
- to encourage the Member States to make all groups (students, teachers, parents, village and community leaders, administrative personnel and policy makers) aware of the need for relevant changes in education (both formal and non-formal) as an essential pre-requisite for the improvement of the quality of life of the people;
- to promote understanding and appreciation of the differences in educational practices and approaches of the Member States, and thereby contribute to international understanding and the creation of a new international economic order.

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INTRODUCTION

Many countries in the Asian region are utilizing more and more low-cost educational materials produced indigenously. These materials include, among others, hand-made educational charts, maps, models, improvised science apparatus, kits, educational toys and games for children.

In accordance with the Work Plan of the Asian Programme of Educational Innovation for Development (APEID), the Regional Workshop in Educational Technology with Special Reference to Development of Low-cost Educational Materials was held at Kuala Lumpur, Malaysia from 5-15 December 1977. The Workshop was jointly organized by the Curriculum Development Centre, Ministry of Education, Malaysia, an Associated Centre of APEID and the Asian Centre of Educational Innovation for Development (ACEID), Unesco Regional Office for Education in Asia and Oceania.

Objectives of the Workshop

The objectives of the Workshop were (i) to exchange experiences in the development of educational materials with special emphasis on prints, games, toys and other low-cost/simple materials and (ii) to consider the use of the environment and locally available materials and other appropriate or adapted methods and techniques being used and developed in the Asian countries.

Participation

There were 23 participants: three from Thailand; two each from Japan and the Philippines; one each from Afghanistan, Bangladesh, India, Indonesia, Iran, Republic of Korea, Nepal, Singapore and Sri Lanka; and seven from Malaysia.

A representative of the United Nations Development Programme (UNDP) Kuala Lumpur, one from Unesco, Paris, and seven from the Ministry of Education, Malaysia attended as observers.

ACEID was represented by the Chief of ACEID, the Specialist in Curriculum Development and the Associate Expert in Educational Technology. A list of participants and observers is given as Annex II.

Inauguration

The Honorable Thun Haji Salleh Jafaruddin, Deputy Minister of Education, Malaysia, in his inaugural address extended his warm welcome to all the participants. He stressed the importance of providing educational facilities including low-cost educational materials to cater to the needs of the ever-increasing student population. In his remarks,

he stated that there is a great need to explore new approaches and to seek new strategies and directions in designing, developing and utilizing educational materials. He also mentioned that the varied programme of activities provided by Unesco during the last decade has made a sizable contribution towards the advancement of education in the Asian region and hoped that the services of Unesco will continue undiminished in the years ahead. The text of the speech is given in Annex IV.

Before the inauguration of the Workshop, Miss Asiah binti Abu Samah, Director, Curriculum Development Centre, as Chairman of the Workshop Organizing Committee, welcomed the participants on behalf of the host institute. She also indicated briefly the activities that would be undertaken during the Workshop.

Dr. Latif, Chief of ACEID, welcomed the participants on behalf of Unesco and thanked the host Government and its Ministry of Education, particularly the Deputy Minister of Education and the Deputy Director-General of Education for their attendance at the Inauguration; the Malaysian National Commission for Unesco for its continuous support and co-operation; and the Director and the staff of the Curriculum Development Centre for hosting this Workshop and for their outstanding preparatory work. Regarding the financial support, he particularly mentioned the contribution of UNDP which met most of the expenses of this activity. He also introduced the philosophy and salient features of APEID, stressing the importance of co-operative endeavour and mutual learning among the participants of the Workshop. In his view, the sharing of experiences, co-operative review of trends, growth points and reflections regarding the future plan would contribute to the building of the organization of each country's capacity for strengthening its efforts in the development of low-cost educational materials.

The inauguration was attended, among others, by Mr. Abdul Aziz bin Ismail, Deputy Director-General of Education, Malaysia and Mr. Roger Guarda, Deputy Regional Representative, UNDP, Kuala Lumpur.

Election of Officer of the Workshop

In the first plenary session on 5 December 1977, the participants elected Miss Asiah binti Abu Samah (Malaysia) as Chairman; Dr. M.M. Chaudhri (India), Mr. Aziz Atayi-Langroudi (Iran) and Dr. Pruang Kumut (Thailand) as Vice-Chairmen; Messrs. M.B. Chitrakar (Nepal) and P.B. Dayasiri (Sri Lanka) as Rapporteurs. Mrs. Siti Hawa Ahmad (Malaysia) served as Secretary of the Workshop.

The Workshop also set up a Steering Committee comprising the officers of the Workshop, two ACEID staff and two other participants.

Methods and procedures of the Workshop

In the first plenary session after the election of the officer Miss Asiah, Chairman of the Workshop and the Workshop Organizing Committee presented a paper on the Development of Low-cost Educational Materials - the Role of the Present Workshop. The text of the paper is given in Annex V. This was followed by discussions. In the following few plenary sessions the Workshop discussed the country reports and other experiences including the demonstration of materials which the participants had brought along with them.

Introduction

The Workshop examined the range and scope of existing improvised materials in the participating countries through working groups and prepared a comprehensive list of educational materials being used and could be used in Asian countries. Thereafter the Workshop considered and analyzed trends, problems and issues in relation to the development and utilization of low-cost educational materials.

The Workshop through working groups, formulated guidelines and strategies for designing, production and evaluation of low-cost/simple educational materials, and developed some exemplar materials with their instructional sheets. Each participant prepared a brief write-up on concrete measures based on the experiences gained during the Workshop which may be undertaken in his/her national setting for expansion and reorientation of efforts relating to development of low-cost educational materials.

During the Workshop, several task forces were formed for preparing suggested proposals and topics on certain agenda items to be considered at the plenary sessions and for further discussions in the working groups. Each task force comprised one Vice-Chairman of the Workshop, two participants, two members of the Workshop Organizing Committee and the ACEID staff members.

The Report

A draft report was prepared as a result of the co-operative efforts of each participant, the rapporteurs and the working groups. This was presented at the concluding session of the Workshop on 15 December 1977 and was adopted with some modifications. The suggested modifications have been incorporated in this final report.

Chapter One

PRESENT STATUS OF THE DEVELOPMENT OF LOW-COST EDUCATIONAL MATERIALS - AN OVERVIEW

In most Asian countries there is a need for developing low-cost educational materials for the purpose of improving the quality of education. There are varied reasons which lead to the need for the development of such materials. The types of materials needed and are now used in different countries vary in construction and degree of use. The steps undertaken in developing such materials, the mechanism for development, distribution and evaluation also differ from one country to another. In view of these, the participants of the Workshop in the course of their preliminary deliberations shared their experiences on the current status of the development of low-cost educational materials in their countries. Other related issues and problems were discussed during the presentation of their reports. The write-ups in this chapter are the country-wise summary reports as presented by the participants of the Workshop.

Afghanistan

A. Need for low-cost educational materials

It has been realized that there is a need to use locally available raw materials in the production of low-cost educational materials to be supplied to schools in the country. Such effort is necessary in order to improve the teaching-learning activities in the classroom.

B. Types of materials being developed and used

These include biological models, science and mathematics kits, maps charts, blackboards, solar system models and sunlight-operated projectors. The science and mathematics kits use locally available materials such as paper, wood and metal. For maps and charts, the most common materials used are cloth and paint, as they are easily available and inexpensive.

C. Steps undertaken to develop the materials

Initially, the contents of the textbooks are examined as basic of the designs for the relevant materials to be produced. The production of the materials is done by the Ministry of Education. For developing kits and models, exemplar materials are collected from neighbouring countries and modified to meet the needs of the country. Locally available raw materials are used in the mass production of such modified exemplar materials.

D. Mechanism for development, distribution and evaluation of materials

Apparatus and materials produced by the Audio-Visual Centre have been distributed to some 2,000 primary schools throughout the country. The Audio-Visual Aids Centre at Kabul is equipped with a workshop and a staff of eighty teachers who are responsible for the mass production of teaching materials, which are mainly for the primary level and distributed to schools. Teachers themselves submit feedbacks for the improvement in the design of the teaching materials and these are incorporated in the mass production of such materials. Mobile Units/Teams have been established to train teachers in schools in the development of educational materials.

E. Problems and constraints

There is a lack of trained teachers in the country, hence the lack of skills in the development of appropriate educational materials.

F. Future plans

Activities of the Mobile Units/Teams will be further strengthened to enhance the capacity of the teachers to produce materials appropriate to their own environments.

Bangladesh

A. Needs for low-cost educational materials

In Bangladesh there is an increasing awareness among teachers and educators of the need for educational materials to improve the quality of teaching in the classrooms. Such materials can make the subject matter more comprehensible as well as arouse the pupils' interest and attention. The increasing student population has made it imperative that the cost of materials being used should be as low as possible so that they can be mass produced and widely distributed.

B. Types of materials being developed and used

A variety of materials are being developed and used. Those in the category of low-cost materials include maps and charts, models, specimens, puppets, pictures, demonstration boards and abacus. Others which may be considered low-cost materials are films and filmstrips.

C. Steps undertaken to develop the materials

To ensure that appropriate educational materials are being developed, a number of agencies in the Ministry of Education and some private firms have taken the necessary steps. In addition, teachers are encouraged to produce materials for their own needs.

D. Mechanism for development, distribution and evaluation of materials

The Government has set up the following organizations for the above purposes:

i) The Education Extension and Research Institute which conducts training courses for teachers on the preparation of different types of low-cost educational materials.

ii) The Audio-Visual Education Centre, Dacca, which conducts short courses for teachers in order to motivate them and to train them in the production of educational material. The Centre also produces and evaluates materials that are distributed to schools.

iii) The Equipment Development Board which is responsible for providing guidelines on the development and use of educational materials.

E. Problems and constraints

There is an abundance of social and cultural resources e.g. children's games, dolls, music, dances and dramas, but there has not been sufficient effort in utilizing them for educational purposes.

F. Future plans

Plans for further development of low-cost educational materials will be incorporated in the planning of the total educational system.

India

A. Needs for low-cost educational materials

The high rate of population growth has given rise to a large number of schools in the country. But the necessary inputs for education are lacking, for example, a large number of schools in the villages are one-teacher schools and the contingency funds of a primary rural school ranges from Rs 15 to Rs 20 (US$2-3) per annum. Such funds are inadequate to meet even the basic necessities of the school in terms of chalk, broom, water pitcher, and other minor items. Blackboards and textbooks are the only educational materials found in most schools. The environment of the rural community is rich with resources, e.g. crafts and skills. But these have not been adequately utilized in the educational process.

B. Types of materials being developed and used

Charts and maps are manufactured in the country. They have to be cheap so as to be within the small budget of the urban schools. With government assistance the rural schools are able to purchase them too. In view of the need for cheap materials, these charts and maps are often of low quality in terms of authenticity, colour, printing and durability.

Models that are available are expensive and only some of the urban schools can afford them. Toys, games and puzzles for children are usually not so popular as the supply is scarce and they are expensive.

Most of the science equipment manufactured in the country are meant for high schools and colleges. However, lately the National Council of Educational Research and Training (NCERT) has produced science kits for primary schools.

C. Steps undertaken to develop the materials

All the materials which are to be mass-produced are first developed in the form of prototypes by a team of experts including experienced teachers. The prototypes are developed after a careful study of the curriculum and the availability of raw materials. Once the prototypes have been developed they are tested and modified, if necessary, before they are mass-produced.

As for the materials developed in the individual schools, the modes of production are left entirely to the teachers' initiative.

D. Mechanism for development, distribution and evaluation of materials

The NCERT is engaged in the research, prototype development and mass production of some educational materials such as textbooks and science kits. State Audio-Visual Units and State Institutes of Science are also engaged in developing prototypes. The Ministry of Education has distributed kits on Art and Culture to secondary teacher training institutes.

Effort is being made by the Department of Teaching Aids of NCERT to organize workshops in order to train teacher educators and the rural primary school teachers in the basic techniques of production and utilization of educational materials.

E. Problems and constraints

While steps are being undertaken to develop educational materials, the quantity and variety of materials available are inadequate to meet the growing needs of the teachers. Increasingly more difficult concepts are being introduced into the school curriculum. The development of these concepts is problematic as a large number of teachers are still inadequately trained.

A systematic approach to the development of prototypes, mass production and distribution of educational materials has not been undertaken so far. The question of utilization, maintenance, storage and replenishment of materials also need to be carefully looked into.

F. Future plans

NCERT has plans to establish Centres of Continued Education in different districts to make materials available to teachers for their use in the classrooms. Also NCERT has plans to conduct workshops in the various districts through these centres to continue training teachers in the techniques of production of educational materials.

Indonesia

A. Needs for low-cost educational materials

In the attempt to increase educational opportunities and to improve the quality of education Indonesia faces many problems, one of which is to provide and disseminate educational materials throughout the country. In view of various factors such as the increasing number of school children in the school-age group, the vastness of the country and the limited budgetary allocation, the need for economy in producing educational materials has always been felt. Mass production is one way to achieve this, where the unit cost for each material can be kept to the minimum. Apart from mass production it is felt that such need can be met, among others, by motivating schools and teachers to produce their own teaching aids using raw resources available in their environment.

B. Types of materials being developed and used

The government has prepared prototype educational materials for Bahasa Indonesia, Mathematics, Science and Social Studies for primary education. Fifty sets of each prototype have been produced for try-out in fifty schools. In addition there are also educational toys and games which are produced from local materials such as paper, bamboo and coconut leaves.

Educational toys and games for pre-school education produced by private firms include demonstration boards, arithmetic trees, building blocks, marbles and dolls. In addition to these teachers often make charts, picture cards and many kinds of toys by themselves.

C. Steps undertaken to develop the materials

A workshop equipped with machinery and tools for wood and metal work has been set up in 1977 aimed at designing and producing prototype materials for Science and Mathematics. The workshop also trains teachers in wood and metal work to enable them to produce educational materials using low-cost and easily available materials in the environment.

D. Mechanism for development, distribution and evaluation of materials

For the pre-school children there is a project called the Pre-School Education Development Project which preduces educational toys and other materials for distribution to the schools. In most cases the schools have to purchase toys and other materials by themselves or to rely on teachers' initiative to produce the needed materials.

There is also another major development project called International Development Agency (IDA), Third Education Project which is responsible for producing textbooks, teachers' guides and other prototypes for primary education.

E. Problems and constraints

The pressing problems in connection with the development of low-cost educational materials in the country are:-

i) the development of a better system for providing and disseminating adequate information about low-cost materials;

ii) the provision for bigger budgetary allotment for construction of low-cost materials; and

iii) the development of better training programmes for teachers in relation to construction techniques, and greater efforts to explore the possible raw materials for the production of low-cost materials.

F. Future plans

After the try-out, the phototypes will be revised and mass-produced to be distributed free to primary schools.

There will be more distribution of educational toys to an increasing number of Kindergarten schools.

Plans are also being made by the government to incorporate and co-ordinate the teachers individual efforts in the production of low-cost educational materials.

Iran

A. Needs for low-cost educational materials

The need for the development of educational materials is felt following the Royal Firman of March 1972 on the generalisation of reforms of the educational system particularly in the fields of literacy and adult education. The Ministry of Education has taken positive steps in providing schools with a wide variety of educational materials.

B. Types of materials being developed and used

The materials range from specimens of local products, simple science apparatus, flash cards, portable boards, maps and some sophisticate equipment like overhead, slide and movie projectors and support materials. Many of these materials are commercially produced, nevertheless they can be considered low-cost in terms of multiplicity of uses, effectiveness, durability, availability as well as case of operation.

C. Steps undertaken to develop the materials

Special steps have been taken to foster the development of educational materials, through the in-service courses for teachers, and the establishment of specialised agencies. In addition, teachers are always encouraged to produce materials for their own needs.

D. Mechanism for development, distribution and evaluation of materials

Since its establishment the Organization for Research and Reconstruction of Education has been trying to co-ordinate all innovations in education through its different offices and projects namely: Curriculum Development Centre, Audio-Visual Centre, Iran Education Project (Experimental Schools), and Mashad Educational Technology. In the near future the last three offices will be combined to form the Office of Instruction and Development of Educational Technology.

In addition to the above, the Ministry of Education conducts in-service courses to assist teachers in designing and developing low-cost materials for their classes. The Ministry also organizes exhibitions whereby materials produced by teachers and/or students are displayed for others to see and to use as exemplars.

E. Problems and constraints

The rapid reforms in education demand new types of materials and their optimum use and better techniques of production. The main problem in the development of educational materials is the lack of skilled manpower to design, develop and produce them. In addition, the rapid growth of the school population has meant that supplies of materials cannot keep pace with the demand.

F. Future plans

To overcome the problems indicated above, the Organization for Research and Reconstruction of Education has generated a number of projects to train specialists, to explore various techniques of production, and to utilise to the maximum all existing raw materials.

Japan

A. Needs for low-cost educational materials

With the introduction of various mass-produced and sophisticated educational materials in the classrooms due to the industrial development, there is a felt need for developing low-cost educational materials. The materials for the production of these teaching aids are those which are easily available in the environment and are cheaper and simpler than the sophisticated hardware. These low-cost educational materials are easier to handle and more convenient to use by the teachers and students. The novelty and element of curiosity inherent in low-cost educational materials stimulate and motivate children's interest. Added to these, low-cost educational materials lessen the dehumanizing effect brought about by the high level technology in the country.

B. Types of materials being developed and used

The advancement of science and technology has brought about the development of mass production system including the production of educational materials of various kinds which are usually made of plastic and metals. Among the typical low-cost educational materials are balances and measuring aids, optical kits, interphone kits and simple science kits. Generally such materials are used in the classrooms for demonstration purposes as suggested in the courses of study issued by the Ministry of Education.

C. Steps undertaken to develop the materials

Teachers are encouraged to develop simple materials through in-service teaching training courses and other various seminars and meetings at the district, prefecture and national level.

In most cases, the steps undertaken by the Tokyo Institute of Technology as well as other agencies responsible for the development and production of these materials are as follows:

i) Review various kinds of educational materials;

ii) Select materials to fit educational purposes;

iii) Design and construct prototype materials;

iv) Try-out materials in the field and evaluate them for further improvement; and

v) Produce instructional manuals with illustrations to accompany the educational materials.

D. Mechanism for development, distribution and evaluation of materials

Most educational materials being used in the schools are designed and produced by commercial firms with the help of teachers, administrators and educational researchers. Many of these agencies have their own design, production and evaluation units, and have established their own distribution system throughout the country. Prototypes are also developed by the various educational research institutes and teacher training institutions.

E. Problems and constraints

Although various types of low-cost educational materials are available in most schools, there still exists a problem of development of better materials. There is a need for more specialists and expert teacher-educators to generate the interest and involvement in the development and production of low-cost educational materials. Another problem is that the materials produced in mass scale do not provide enough "cue" to students which is crucial for stimulating their interest and curiosity.

F. Future plans

Attempt is now being made to develop a nation-wide computerized information exchange system in the area of educational technology so that all developmental efforts and other relevant information can be widely collected, centrally stored and disseminated to the concerned teachers and institutions. Teachers will be continuously encouraged to develop simple/hand-made materials through various in-service training courses, seminars and meetings.

Republic of Korea

A. Needs for low-cost educational materials

Regional disparity in educational opportunities is the major problem in the country which justifies the need to provide the schools with adequate physical facilities and educational materials.

B. Types of materials being developed and used

The Ministry of Education has specified certain instructional aids for use in the schools. These include various kinds of audio-visual equipment, display boards and materials, maps, dramas, models, specimens, picture sets, audio tapes and science kits. Many simple and inexpensive materials developed by teachers and students are also used. Other instructional materials such as 16 mm films, slides and transparencies with the appropriate hardware are loaned to schools on a short-term basis through the district audio-visual centres.

C. Steps undertaken to develop the materials

The Ministry of Education has recently revised the list of minimum audio-visual materials and equipment that should be available in the schools throughout the country. It is expected that within the next five years or so the schools would be equipped with such materials. Loans are made available to the schools for the purchase of such needed materials. Teachers through pre-service and in-service training have been made aware of the values of low-cost educational materials in the teaching-learning situations.

D. Mechanism for development, distribution and evaluation of materials

The National Institute of Education conducts in-service training for teachers who have had no formal training on the development of teaching aids as well as to up-date the knowledge of those already trained.

In some schools workshops are organized during the summer and winter vacations so that teachers can develop their own educational materials with the maximum use of local resources.

Since 1976 science kits have become commercially available. They are low in cost and are distributed nation-wide by the Science Equipment Corporation operated by the Korean Teachers Mutual Fund.

E. Problems and constraints

In spite of the general awareness of the benefits of using educational aids it is apparent that many teachers are still reluctant to use or to develop them. In large schools especially in the urban areas, teachers find teaching ineffective with as many as 80 pupils in one classroom.

F. Further plans

The Ministry of Education plans to standardise the size of schools and classes. It is planned that the number of pupils per class will be reduced to 60 and to 45 in the urban and rural areas respectively. By 1981 TV will be available for instructional process in the elementary schools and teachers' training colleges throughout the country. With these developments, it is expected that teachers will be more motivated and will find more time to produce and utilize educational aids more effectively.

Malaysia

A. Needs for low-cost educational materials

Malaysia being multi-racial and striving for the economic betterment of its people faces the dual task of establishing its national identity and making the right step for the allocation of its resources. Within this contextual background education has to play its dual role. The school curriculum can therefore be viewed as prescriptions for the achievement of development objectives and national aspirations. In the process of trying to achieve these aspirations we come to grasp with the idea of the need for educational objectives, methodologies and materials which are relevant and meaningful while at the same time within our means to provide.

B. Types of materials being developed and used

At the moment a number of teaching-learning materials are being developed. They are categorised as prototypes developed by the Curriculum Development Centre (CDC) of the Ministry of Education and those made by teachers to be tried out and then used in the classrooms. Some examples of such prototype materials are ray optics kit, ripple tank, portable gas and water suppliers, and multi-purpose desks and chairs. The other category of materials are those developed by teachers, either by themselves or with the help of officers from the CDC. These include charts, models and all kinds of story-boards which are tested and utilized as they are developed. In all cases these materials have been designed and produced for specific projects such as Compensatory Education, Integrated Primary Curriculum, Social Studies, Primary and Secondary Science and Mathematics and language teaching.

When these educational materials have been finalised the Educational Media Service Division (EMS) of the Ministry of Education and private firms will take over for mass production and distribution to schools throughout the country.

C. Steps undertaken to develop the materials

Production for appropriate kinds of materials is still a major concern. Steps have been undertaken to ensure suitability in terms of design, development and production of these materials. One way is through the on-the-job training of curriculum officers. Another way is through workshops/seminars and interaction with specialists especially in the area of educational technology. At the same time a well-equipped workshop was set up at the Curriculum Development Centre for the purpose of producing effective and suitable prototypes of teaching-learning materials.

Teachers themselves are sources of ideas and their experiences are very important in the development of materials. Hence they are not only encouraged but also exposed to new ideas and techniques through in-service courses to devise, improvise and develop materials for use in schools. It has become a standard practice in the Curriculum Development Centre to call teachers for in-service training when a curriculum is being revised or introduced for implementation.

D. Mechanism for development, distribution and evaluation of materials

Prototype materials are always developed within the Curriculum Development Centre in conjunction with other curriculum projects. Two approaches are adopted:

i) materials which are produced as substitutes for the costly ones;

ii) materials which are produced to fulfill the requirements of curriculum projects being experimented and tried out in schools.

Both types of materials are fully evaluated in pilot schools before they are passed to private firms for mass production. Distribution is left to the private firms which have their own mechanism and infrastructure to perform such a task. However, the Ministry of Education undertakes periodic checks in order to ensure that the materials supplied to schools are of high quality.

Teachers on their own also produce materials in their schools. Occasionally these teachers interact with each other during in-service courses and workshops whereby objective evaluation is achieved. If such materials proved to be suitable and effective they are taken as exemplars to be used in other schools. The Curriculum Development Centre acts as a clearing house in this matter. Materials for mass production are supervised by the Educational Media Service with the co-operation of private firms. In most cases regional centres of the Educational Media Service perform the evaluation before these materials are distributed to all schools.

E. Problems and constraints

The shift to local production, evaluation and distribution of educational materials creates a number of problems. This is the result of the constraints faced by the Ministry of Education. The exercise demands a number of inputs in terms of finance, time and above all expertise in various areas. To develop suitable materials would also involve the services of specialists in psychology, sociology, educational technology, evaluation and experienced practising teachers, to name a few. To get a concerted effort of these specialists is a problem because they have their own commitments elsewhere and it is quite difficult for them to meet regularly.

The second problem is that of diffusion and adoption of ideas on educational materials. Coupled with this is the problem of effective utilization of materials which have been sent to the schools. The latter is mostly concerned with the problem of management - storage, maintenance and replenishment. There are a number of charts and learning kits sent to schools which are under-utilized as well as poorly maintained.

F. Future plans

The aforestated problems are the results of the constraints faced by the Ministry of Education. With regard to production of materials the concern at the moment is not so much on quantity as on quality. The quality of educational materials could be enhanced by the multiplicity of their usefulness. If such materials and techniques of usage are to be effectively implemented an efficient mechanism for the diffusion of these ideas have to be sought. The Curriculum Development Centre will continue to play its role, among other things, as a clearing house.

In-service training alone has been found to be inadequate and insufficient for the dissemination of innovations. Therefore, alternative ways to diffuse innovations in educational materials to schools have to be searched. The other major concern is that adequate evaluation should be carried out on materials that are sent to schools. Certain ways of monitoring these materials have to be undertaken systematically. The problem of storage, maintenance and replenishment will also have to be looked into seriously in order to ensure that materials sent to schools are utilized effectively.

Nepal

A. Needs for low-cost educational materials

In Nepal the felt need to provide education to the whole population of the country is due not only to the existing high illiteracy rate but also to the realization of the people of the importance and potential of education. This situation is not easily improved in view of the fact that there are not enough qualified teachers to meet the demands of the schools. There have to be alternative ways for the educational programme which would emphasize local studies and the utilization of available resources

to be designed and developed into supporting educational materials. The educational processes can then be enhanced to make learning activities more relevant to the environmental context of the learner.

B. Types of materials being developed and used

The type of materials that are currently developed or used can be classified under three categories, namely:

i) Freely available local materials under experimentation to make simple teaching aids and toys;

ii) Materials which have been commercially produced such as charts, films, filmstrips for all levels and simple science apparatus and kits for secondary and upper secondary schools; and

iii) Educational radio programmes for all the schools in the country.

C. Steps undertaken to develop the materials

Attempts have been made to expose and orientate teachers and the community on the ideas and concepts of low-cost educational materials. One effective method which has been adopted is through radio broadcasts. Another approach is dynamic displays of some samples from which teachers develop ideas on low-cost teaching materials utilizing locally available resources.

D. Mechanism for development, distribution and evaluation of materials

The Janak Educational Materials Centre (JEMC) is responsible for the design, development and production of charts by silk-screen process and other visual aids to be sent to schools.

The Science Equipment Centre of the JEMC is also responsible for designing and developing simple science equipment for secondary and higher secondary schools. Many studies have been carried out to find out the possibilities of developing low-cost educational materials.

The work and functions of JEMC is also augmented by educational radio service. There are two types of educational broadcasts: School Broadcast which has six programmes a week, each of thirty minutes duration; and Teachers' Programme which has two programmes a week each of thirty minutes duration. There are other radio programmes such as those touching on family planning and agriculture. All these broadcasts directly or indirectly emphasize the need for improvisation of low-cost educational materials by teachers, pupils and the community.

Not all educational materials which are designed and developed by JEMC are sent to schools as some of them need to be tested further and the processes of mass production and distribution have to be worked out. At present teaching materials are distributed by the four regional directorates of education in the country. Most of these materials are utilized by pupils along with the school radio programmes in the classrooms.

Low-cost educational materials

So far there has been little evaluation on the development and production of educational materials. Only recently a team of researchers under UNICEF sponsorship has carried out some evaluation studies on the effectiveness of visual illustrations like line drawings, three-tone drawings and photographs. Some recommendations have been made from this evaluation exercise and follow-up activities are being carried out. Frequent field studies by teams from various educational agencies plus feedbacks from teachers and students are other forms of evaluation in this area of concern.

E. Problems and constraints

Though some efforts and progress have been made in the development and production of low-cost educational materials, the main problem is the lack of sufficient skilled personnel to take the initiative and generate activities in this direction. There is also the reluctance of teachers and parents to participate fully in such an activity. Other problems are the lack of funds and the geographical remoteness of many of the schools in the country which adversely affect the development and distribution process and activities.

F. Future plans

In the light of some of the efforts that have been made and the problems encountered, the following steps are being anticipated to improve the existing situation:

i) Rapid diffusion of low-cost technology in the rural areas;

ii) Motivation of teachers and parents to ensure wider participation;

iii) Expansion of physical facilities;

iv) Training of rural personnel in the design, development and utilizations of low-cost educational materials; and

v) Increase production of materials for wider distribution.

Philippines

A. Needs for low-cost educational materials

The abundance of commercially produced educational materials in our schools is noticeable especially in the urban areas. But with the existing limited school funds, not all classrooms particularly in the rural areas can be provided with adequate instructional materials. The classroom teachers in their desire to improve the quality of their instruction have become aware of the effectiveness of simple and inexpensively prepared educational materials. They also have come to realise that the local environment is rich with materials and resources for instructional purposes. Furthermore, teachers have accepted the fact that when pupils, parents and even the community are involved in the production, the effectiveness of such educational materials is almost certain because they are specifically related to the learning experiences of the children.

B. Types of materials being developed and used

Among the simple and locally produced educational materials being used in the schools, and which are still undergoing further improvement in the country are: graphic materials which include flat pictures, charts, diagrams, flash cards, graphs, posters, dioramas, demonstration boards including chalkboards, bulletin boards, plannel boards, magnetic boards, electric boards; 3-dimensional materials which include objects, specimens, models, mock-ups, aquarium, terrarium, masks, puppets, and sandtable representations; and various types of native dolls, toys and games which are of educational value to the children.

C. Steps undertaken to develop the materials

Most teacher education institutions in the Philippines offer an elective course on the basic principles of selection, preparation, utilization and evaluation of audio-visual materials. In the graduate programme of some universities courses leading to specialization in educational media are offered wherein teachers and further teachers acquire further competencies and insights into the total development and administration of an effective educational media programme. To up-date and strengthen teachers' skills and competencies in developing low-cost educational materials there is also a continuing in-service education programme being conducted by the Department of Education and Culture on the national, regional, provincial and local school levels. The co-ordinated efforts and encouragement being made by the educational administrators, the educational media supervisors, and other school officials are positive steps towards enhancing the development of low-cost educational materials in the country.

D. Mechanism for development, distribution and evaluation of materials

The Department of Education and Culture initiates the overall development, distribution and evaluation of low-cost educational materials which are produced by commercial firms and private agencies of former educators. They are evaluated by a special committee in relation to their relevance to the school curriculum before any material is purchased by the school authorities for the schools in their divisions.

E. Problems and constraints

The quality and effectiveness of simple, low-cost materials have been conditioned by the limited knowledge and skills of teachers, pupils and the community in their construction schemes or techniques, as well as the lack of adequate encouragement and professional help from supervisors and technicians. The limited financial support or the small budgetary allotment for the purchase of available educational materials and/or supplies for their construction affect adversely the production, utilization and evaluation of the much needed educational materials in most schools especially in the rural areas.

F. Future plans

The in-service programme of teachers on the maximum use of indigenous raw materials in the production of low-cost materials, the optimum use and evaluation of such materials will have to be stepped up through the national and regional curriculum development centres. The current interest in the organization of learning resource centres in strategic areas in the country will enhance the development of low-cost educational materials.

Singapore

A. Needs for low-cost educational materials

Many teachers are fully aware of the need to grow out of the "chalk and talk" method of teaching and to adopt newer techniques involving the use of relevant educational materials in the teaching-learning situations. The inception of the Singapore Educational Media Service (SEMS)in 1967 has made teachers more aware of the importance of the various audio-visual media for instructional purposes. Besides the production of ETV programmes, the service also produces charts and other low-cost support materials. In 1973, the Audio-Visual Unit of the Inspectorate joined forces with the ETV Service and the Singapore Educational Media Service was established. With a team of seven Media Advisors working actively in the field, more teachers have started to prepare their own instructional materials using local resources.

B. Types of materials being developed and used

The most widely used low-cost materials are simple, improvised and inexpensively produced non-projected aids such as charts, posters, diagrams, flashcards, workcards, picture postcards, puppets, flannel or felt boards, toys and games and available objectives and specimens. Other materials, though the cost may not be as low as the above, include 3-dimensional aids, audio cassettes, records, slide kits and transparencies.

C. Steps undertaken to develop the materials

Since the Lim Tay Boh Report on the Commission of Inquiry into Education in Singapore (1963) recommended the greater and wiser use and application of teaching media and resources in all schools and in the teacher-training institutions, the Department of Educational Technology, Institute of Education, and the Singapore Educational Media Service have steadily increased their programmes on the preparation, production and utilization of instructional materials.

Some of these materials are usually produced by the teachers individually or in groups. Children are also encouraged to develop materials as part of their follow-up activities. Singapore Educational Media Service produces low-cost tape/slide kits as well as charts and audio cassettes to assist teachers in upgrading their classroom activities.

D. Mechanism for development, distribution and evaluation of materials

The low-cost tape/slide kits, charts and audio cassettes produced by Singapore Education Media Service are sold to schools at subsidised rates. Each kit which comprises over 260 colour slides, 10 cassettes, 10 story sheets and one teacher guide costs only S$100.- and audio cassettes on language studies are sold at S$3.- each. Singapore Educational Media Service is responsible for the evaluation of the proper utilization of such materials in the schools. In addition to the production of materials, Singapore Educational Media Service runs an Instructional Materials Library (IML) which provides commercially produced materials for loan to schools. Expensive instructional materials like 16 mm educational films, sound filmstrips, multi-media kits, language laboratory tapes, etc. are made available to schools which cannot afford to buy these materials for the present. The library also has a collection of simple teacher-prepared materials to serve as prototypes for in-service training programmes.

To encourage and to assist teachers to produce their own simple instructional materials, Singapore Educational Media Service Media Advisors conduct regular in-service courses for teachers. These courses are run on a modular basis.

In addition to these in-service courses, Media Advisors also conduct workshops in individual schools using equipment and scrap materials available in the locality.

Pre-service training of teachers is done by the Institute of Education (IE). Students are required to know about types, features and utilization of Audio Visual materials and equipment in the classroom. They are encouraged to design and produce their own instructional materials whenever possible for integration into their teaching practicum. Emphasis is placed on the use of low-cost and easily available materials found in the household among which are discards or scraps for the production of simple and appropriate materials, rather than on the provision of elaborate and expensive apparatus.

E. Problems and constraints

There is still media-resistance among teachers as the production of instructional materials, whether sophisticate or low-cost, is time consuming. It takes a motivated and committed teacher not to be deterred by this problem.

F. Future plans

There will be concerted efforts by both the Institute of Education and Singapore Educational Media Service in providing in-service training in the preparation and utilization of instructional materials. Further development of low-cost materials by Singapore Educational Media Service is expected to result in an increased awareness among teachers of the importance of media as well as in the intensive use of such materials in helping children to learn more effectively.

Low-cost educational materials

Sri Lanka

A. Needs for low-cost educational materials

In the development of education Sri Lanka faces several problems in terms of improving standards, expansion of educational opportunities, reduction of wastages and scarcity of financial resources. To solve these problems new approaches in education have been adopted. In both the primary and secondary schools most of the activities are pupil-centred. Such activities, however, require appropriate materials and equipment. The utilization of environmental resources and the national cultural heritage for designing, developing and producing such materials is one of the ways to overcome the financial constraints.

B. Types of materials being developed and used

In the primary and secondary schools teachers use low-cost educational materials made from local resources. Such materials include masks and puppets, display mats and boards, musical instruments, toys and games, models of animals and transportation facilities, and science kits. Some social science materials and communication arts materials are also available.

C. Steps undertaken to develop the materials

Two approaches are being undertaken in the development of materials. For the materials which are not to be mass-produced, they are developed through in-service programmes. In these programmes, teachers who do not have previous pre-service training are given courses in the development of educational equipment and materials. Such programmes have proved effective in exposing teachers to the uses of easily available low-cost materials. Simple publications and brochures about educational materials have also proved helpful.

For materials to be produced on a large scale, especially of science equipment and kits, a committee in the Curriculum Development Centre of the Ministry of Education looks into the appropriateness of the designs. After field trials, the designs of the materials are passed on to the central production unit of the Ministry of Education or to the private firms. In some cases the designs are disseminated to teachers for them to produce the materials on their own, or with the co-operation of pupils and the community.

D. Mechanism for development, distribution and evaluation of materials

The development of materials is mainly through in-service programmes wherein the experiences of expert teachers are highlighted and others encouraged to be creative.

To ensure that teachers acquire the basic or necessary equipment especially in science, the Central Science Store of the Ministry of Education purchases the commercially produced materials for distribution to schools in the country.

Present status

At present there is no systematic evaluation of the materials supplied to schools. However, the field staff of the regional education service occasionally looks into the utilization of these materials.

E. Problems and constraints

The existing obstacles which limit the development of low-cost educational materials in the schools are:-

i) inadequate skills of most teachers in the construction of educational materials;

ii) lack of appropriate construction tools; and

iii) inadequate supply of raw materials in the country.

F. Future plans

With the felt need for further development of low-cost educational materials to improve the quality of education in the country, the following measures are expected to be undertaken:-

i) further exploration of raw resources, particularly in the rural areas; and

ii) greater involvement of craftsmen, teachers, administrators and the community in designing, development, and evaluation of low-cost educational materials.

Thailand

A. Needs for low-cost educational materials

One of the major problems of education in Thailand is how to keep up with the demand for quality education brought about by the rapid school population growth and disparity of educational materials between the urban and the rural schools. To cope with this demand, the introduction of new technology including the development and production of low-cost educational materials is imperative.

B. Types of materials being developed and used

In Thailand, other agencies aside from the teachers have developed and produced low-cost educational materials. These include, among others, two-dimensional graphs, charts, maps, posters and picture sets as well as 3-dimensional ones like models, specimens, puppets, dioramas, and simple science kits.

C. Steps undertaken to develop the materials

Teachers generally utilize local resources to develop their teaching materials. On the other hand, the Ministry of Education, teacher colleges and universities frequently conduct in-service training programmes where most elementary and secondary teachers learn to develop simple educational materials using locally available raw resources.

D. Mechanism for development, distribution and evaluation of materials

At the moment, there are agencies responsible for facilitating the production of various kinds of prototype materials for dissemination. These agencies are the Curriculum Development Centre, Centre for Educational Innovation and Technology, Institute for Promotion of Science Teaching and Technology, Educational Materials Centre, Teachers' Councils Materials Production Agency and the regional education office.

E. Problems and constraints

Some of the problems in the development of low-cost educational materials are: the limited budget of the Ministry of Education; the indifference of some teachers towards locally produced materials; and the teachers' lack of "know-how". Further more the expertise of other agencies have not been adequately involved or utilized in the development programme.

F. Future plans

There is a plan for strengthening the development programme for low-cost educational materials through the nine universities and thirty six colleges responsible for training teachers. The Ministry of Education also plans to hold more in-service training seminars for elementary and secondary schools throughout the country in order to develop proper attitudes and to provide them with the necessary skills and competencies for the development and production of low-cost educational materials.

Chapter Two

SYNTHESIS OF EXPERIENCES AND PROBLEMS ON LOW-COST EDUCATIONAL MATERIALS

The first hand information on the existing state of low-cost educational materials which have been developed in the member countries, and the experiences and problems relating to the field as presented by the participants in the Workshop, have exposed to a considerable extent the outlook and technology involved in the area of low-cost educational materials. With the exception of a few examples whereby relatively developed technology was observed, it was felt that a large number of the materials used in most countries are common in nature. Problems which seem to be pertinent and which require thorough consideration are both theoretical as well as practical. These problems were discussed at length in the workshop and are presented in this chapter.

A. Conceptualization of low-cost educational materials

It was considered in the Workshop that an educational material is low-cost if it has the following characteristics:

i) The raw materials are freely and easily available from the local environment. These materials can be of natural resources (e.g. bamboo, shells, leaves), industrial and domestic waste/discarded materials (e.g. empty tin-cans, fused electric bulbs, bicycle parts, etc.);

ii) The materials can be made by teachers, pupils or member of the community;

iii) The materials can be put into effective use by the teachers and pupils in the classroom and do not incur unnecessary cost;

iv) The processes involved in the production of the materials are simple and inexpensive; and

v) The production of the materials is not time consuming.

The actual interpretation of the above characteristics may vary from one country to another depending on its socio-economic and cultural context. For example, bamboo is a low-cost locally available material in many parts of the Philippines, Malaysia, Thailand and Indonesia but this is not so in Singapore and Japan. For the latter countries, bamboo can be substituted by easily available and cheap plastic or PVC tubes. Similarly, the techniques and processes of production of bamboo-based materials could be applied to the production of other similar materials. In any activity that involves designing and production of educational materials there is the over-riding concern that these raw materials should not only be easily available but also easy to processed into a teaching aid or learning kit. Such considerations take into account the eventual utilization of these materials. The latter should meet the requirements of the

curriculum and be within the context of the child's environment. When materials are easily available the process of development too need to be inexpensive, while the range of their utilization should as far as possible be wide and varied. Last but not least, low-cost educational materials should not pose much problems of maintenance and replenishment inasmuch as the raw materials could be easily procured from the immediate environment of the learners.

B. Integrating local environment, cultures and traditions with the development of low-cost educational materials

Integration of local environment, cultures and traditions with the development of low-cost educational material is a complex process. It was considered essential in the Workshop to understand the meaning of different elements which need to be integrated and the manner in which their integration could be made possible. The following elements under discussion were considered very important:

i) Local environment

This is the immediate physical surroundings which have natural as well as man-made resources. Natural resources could be wood, leaves, corals, shells, bamboo, or others. The man-made resources could be plastic sheet/tube, bicycle parts, torch bulbs or many others.

ii) Culture and tradition

These are inter-related very often with the environment. Man's culture and traditions are manifested in religion, festivals; ceremonies, clothing, food, music and dances, art, folk traditions and games and toys; and

iii) Vocation is quite often related to i) and ii). It could be agriculture/farming, fishing, commerce, industry, or others.

The development of educational materials obviously must focus its attention on the pupils who will be most affected by their use. The agents for such development can be teachers, parents and people from the community. The involvement must give rise to an educational process which is functional and related to the community, the environment and the culture and tradition, as well as the vocations of the people around.

It was also felt that there is the necessity for the pupils, parents and community to be actively involved in school activities in order to arrive at a realistic development programme of low-cost educational materials. The present situation in the Asian region in terms of their involvement is far from satisfactory even though in many schools there exist "Parent-Teacher Associations".

It was further felt that every school in the community should become a centre of many social and cultural activities in addition to its being an educational institution.

The school should be able to draw the pupils, parents and community to participate in any of these activities. For example, pupils may participate in such activities as country sports, music, art, dance and puppet shows; the parents and the community in school fairs, demonstrations, festivals and exhibitions. The school could organize educational activities such as:

i) Adult Literacy Programmes;

ii) Dissemination of state/national programmes on health, family planning, food production and nutrition education, environmental education, and others;

iii) Mass media programmes with the use of printed materials, radio and television; and

iv) Library programmes with books and other reading materials for the community in the evening or at their leisure time.

The headmaster or school principal should play a key role in organizing the above programmes. Unless the school takes active part in initiating and conducting the programme, it may not be possible to expect full participation and involvement from the parents and the community.

C. Motivation for effective development and utilization of low-cost educational materials

The effectiveness of the development and utilization of low-cost educational materials may be attained not only by the application of knowledge and techniques but also by the willingness and determination of responsible persons who are involved in the programme. In this respect the psychological factors involving incentives and other motivating elements will play an important role. In many cases teachers are found to be resistant, or lacking in interest or enthusiasm in developing and using low cost materials. Some may use the materials without due consideration of the outcomes which may result in the changes of behaviour of the children, teachers and others concerned. In order to improve the situation it is necessary that a thorough investigation into the matter is made. First, it is imperative to know the people who could be motivated for maximum involvement in the development and use of the materials. As identified in the Workshop they include school teachers, curriculum and subject specialists, pupils, education administrators, supervisors/inspectors, parents, local manufacturers, craftmen and specialists like economists, psychologists and sociologists. They next step is the identification of production strategies and the learning needs of children. The strategies may vary according to the problems which hinder their effectiveness. The in-depth study of the above has enabled the participants to identify the problems relating to the motivation factor and to recommend strategies for solving them. Some examples of problems and motivation strategies in some countries are:

People involved	Problems which may hinder effectiveness	Motivation strategies for effective development and utilization
Teachers	Lack of awareness of the importance of materials for learning.	More in-service training on the development of low-cost educational materials.
	Inadequate skills in production or construction techniques.	Special courses in pre-service training of teachers.
	Lack of time.	Reduce the teaching load and extra work.
	Inadequate facilities.	Evolve new strategies for classroom management.
	Low level of incentives.	Integration of overlapping subject areas.
	Indifference or resistance.	Provide for recognition.
	Administrative constraints.	Provide manuals of competencies and guides on production and utilization.
		Provide opportunities for exchange of ideas.
		Provide appropriate incentives
		Provide resources and facilities.
Pupils	Lack of Motivation.	Give appreciation, recognition of pupils' contribution.
	Inadequate opportunities for participation.	Provide for pupils' involvement in making teaching materials.
	Lack of guidance.	Give training on fundamental skills for the production of materials.
	Inadequate skills.	Integrate production/preparation materials in some subject areas: (eg. posters in art class models in practical arts class etc.)
	Lack of time.	Promote school/classroom projects, class publications and displays.
	Lack of resources, facilities and funds administrative constraints.	Provide for PTA involvement.
	Domestic constraints.	

People involved	Problems which may hinder effectiveness	Motivation strategies for effective development and utilization
Teacher Educators	Indifference/ reluctance	Maximize involvement in the design-ing and production educational ma materials.
	Inadequate skills.	Provide facilities.
	Lack of resources and funds.	Conduct workshops and seminars to update knowledge and skills, and establish favourable attitudes.
	Traditional metho-dology.	Maximize exposures to trends and ideas through visits and exchange of personnel
	Lack of initiative and resourcefulness	Encourage action-oriented research
	Uninformed of the classroom situa-tions	Reduce instructional time and other administrative duties.
	Administrative constraints.	Attendance at seminars/advanced studies programme.
Specialists	Lack of incentives/ motivation	Maximize involvement at every phase of material development.
	Indifference/reluc-tance.	Provide appropriate incentives for contribution (allowances, royalties, recognition through dissemination).
	Lack of recognition.	Proper placement.
	Personal con-straints.	Broaden perspective through visits and exchange of personnel.
		Create more permissive atmosphere.
Administrators/ Inspectors/ Supervisors	Lack of orientation towards production of materials.	Involvement in curriculum develop-ment project.
	Lack of interest/ motivation.	Organize special workshops and seminars on educational materials.
	Personnel con-straints.	Broden perspective through visits and exchange of personnel.
	Misperception of their role.	Put up or organize exhibition and contents/demonstrations in design-ing educational materials.
	Inadequate skills and competencies	
	Lack of initiative and innovative attitude.	

D. Promoting optimum use of educational materials

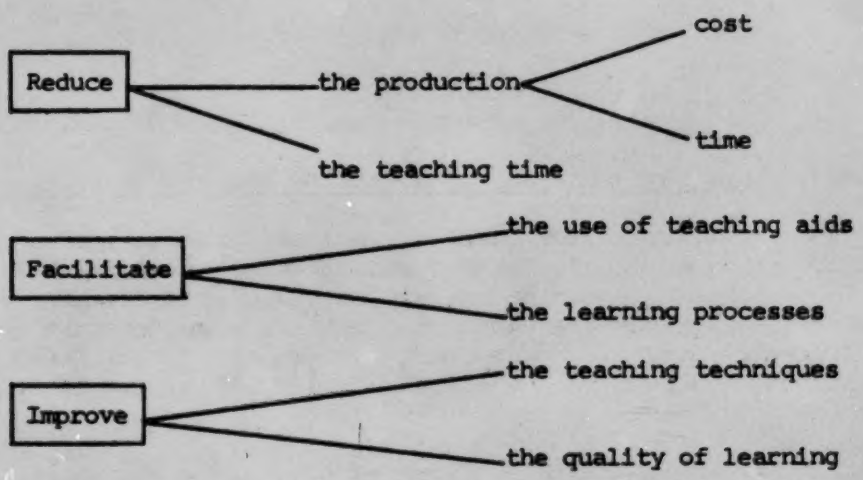
One of the important problems relating to low-cost educational materials is the problem of utilization. It has occurred in many instances that the materials that have been developed and distributed to schools have not been put to full use. Either the teachers do not know to use them or they are not relevant to the teaching-learning situations. There may be other local reasons relating to this problem. It is necessary therefore, that the problems encountered are identified and possible ways and means for solving them are sought. The following recommendations made by the participants of the workshop may not be exhaustive but they may be used as guidelines for further explorations. It should be noted that the strategies and practices which are meant to solve a particular problem could also be applied to some other problems. It is the responsibility of those concerned to decide which strategies and practices would be most applicable.

Problems	Strategies	Practices
Limited uses	Provide suggestions and ideas for divergent use.	Demonstrations, publications with illustrations, monographs.
Non-imaginative utilization	Provide training on the proper utilization of materials and equipment.	Illustrated manuals and guides on the use of materials and equipment.
Non-use of materials for fear of break-age, accidents and damage.	Provide training in the proper handling and maintenance of equipment.	"Hands-on" sessions and workshops.
Lack of competence in handling the materials.	Provide for evaluation of teacher performance with reference to utilization of materials.	a) Regular classroom supervision/inspection school authorities; b) Survey through questionnaires; c) Action research by curriculum developers.
Lack of appropriate physical facilities	Provide adequate physical facilities and spaces.	a) Special work rooms; b) Multi-purpose rooms; c) Classroom learning centres with minimum essential facilities.
Inadequate management of materials service system.	Organize service system; establish learning resource centres.	a) Storage facilities; b) Properly trained assistants; c) Appoint skilled/trained personnel; d) Start a functional learning centre in pilot schools

E. Dissemination and distribution of low-cost educational materials

In the development, dissemination and distribution of low-cost educational materials, it is essential to realize the objectives or goals for such an educational venture. The main objectives are to reduce the production cost, the time of production and also the learning and teaching time. Other objectives are to facilitate the use of teaching aids in the learning processes, and to improve the teaching technique and the quality of learning.

The objectives may be graphically presented as follows:



All the aforestated objectives should be borne in mind throughout the processes of development, dissemination and distribution. All these three processes are carried out through the various steps or stages as shown by Flow Chart A. The people involved in the processes are:

i) School Teachers/School Principals;

ii) Teacher Educators; and

iii) Ministry of Education Personnel.

Dissemination may be implemented at all stages from the introduction of the basic theoretical or practical ideas leading to the technique and purpose of improvisation of low-cost educational materials, through the final "Patented Teaching Aids" for mass production.

As dissemination is done, distribution process should also be simultaneously carried out. The steps or activities that may be undertaken could be as follows:

i) Inform what low-cost materials are undergoing development and production;

ii) Display or exhibit the low-cost materials;

iii) Demonstrate the method of making the teaching aids and how to use them effectively and for varied purposes;

iv) Train the teachers to use the educational materials that have been already produced and eventually to produce their own; and

v) Carry out continuous evaluation of the above four activities.

Further exercise of dissemination and distribution may be through:

i) Publication of bulletins and newsletters, journals, handouts, and guide books;

ii) Seminars and workshops;

iii) Exhibitions and displays;

iv) Media services such as ETV and Radio;

v) In-service courses;

vi) Contests/Competitions;

vii) Personnel visitations; and

viii) Attachments to various educational agencies.

F. Promoting inter and intra-country exchange of experiences

As shown in Flow Chart A, the three categories of people (Ministry of Education Personnel, Teacher Educators and School Teachers) can carry out the development, dissemination and distribution of low-cost educational materials independently and/or co-operatively throughout the development processes. There are however pilot projects to be carried out first and with continuous feedbacks and evaluations which lead to the final project as shown in the Flow Chart.

To facilitate the exchange of ideas and experiences, it is necessary that the three strata be inter-related at the decision making stage where the School Principals and the Teacher Educators levels pass on their designs and projects up to the Ministry of Education for final decision to be passed on to the production of the final products.

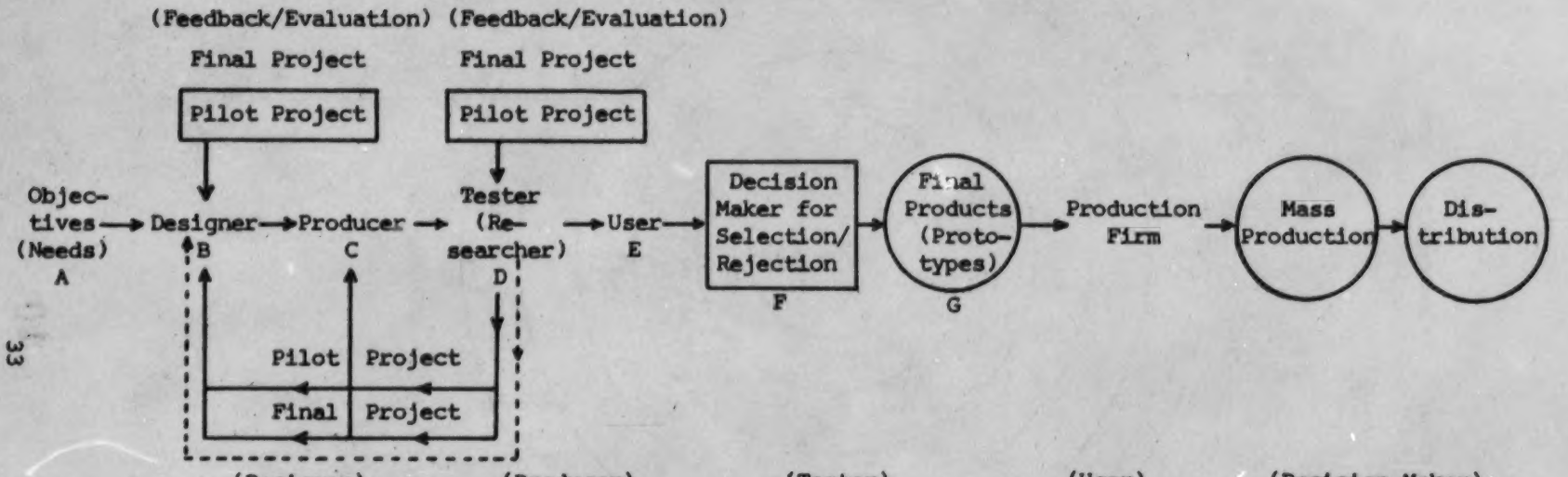
Diagram B illustrates that this process on inter-country exchange of experiences can be extended through regional co-operation among the countries involved through their respective Ministry of Education. The most suitable means of promoting distributions of experiences and ideas regarding low-cost educational materials would be possible through:

i) Publication of bulletins, newsletters, journals, handouts, guide books in English as well as in the language of the receiving country;

ii) Exchange system of cassette tapes, slides, filmstrips with captions, literature and instructions in English as well as in the language of the receiving country; and

iii) Distribution among member countries of special instruction books on the development of low-cost educational materials with maximum illustrations and relevant instructions.

Flow Chart A. On the Development, Dissemination and Distribution of Low-cost Educational Materials



People involved	(Designer)	(Producer)	(Tester)	(User)	(Decision Maker)
	School Teachers	School Teachers	School Teachers	School Teachers Pupils	School Principals
	Teacher Educators	Teacher Educators Trainees	Teacher Educators Trainees	Teacher Educators Trainees	Teacher Educators
	Ministry of Education Personnel	Ministry of Education Personnel	Ministry of Education Personnel	Teachers Pupils	Ministry of Education Personnel

Intra/Inter-Country Exchange Programme
on the Development, Dissemination and Distribution
of Low-cost Educational Materials

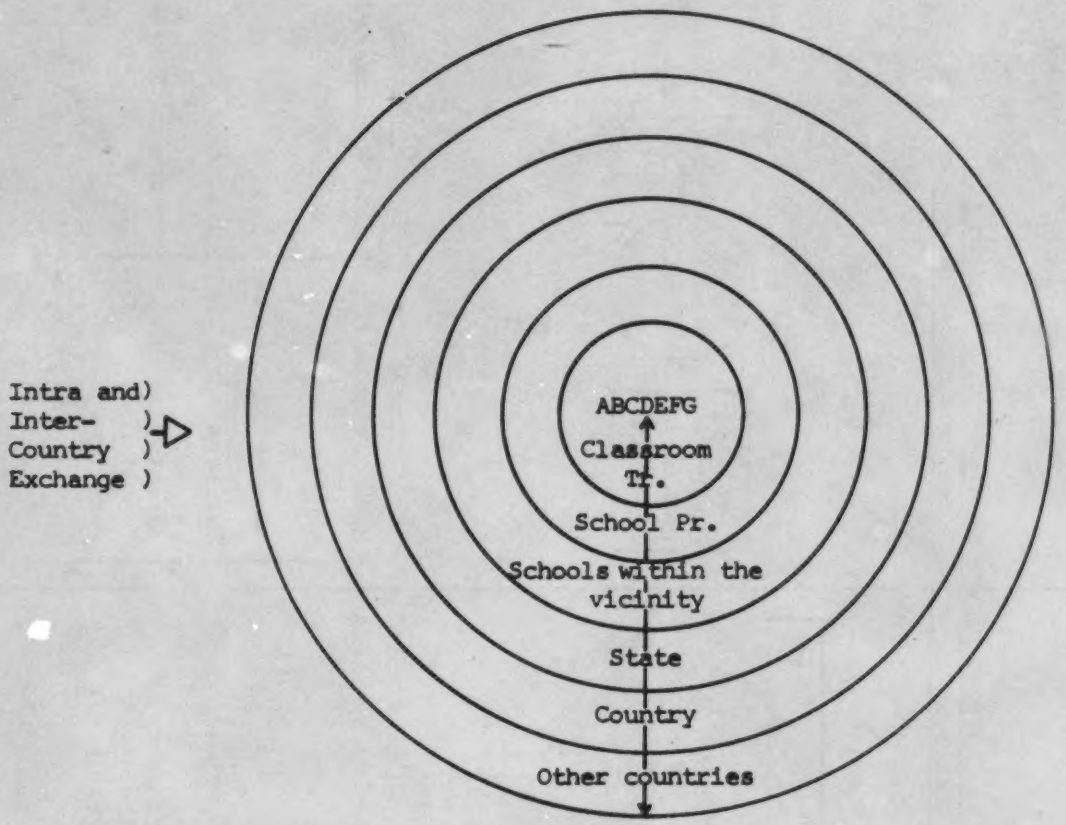


DIAGRAM B.

Note: A - Objectives
B - Designer
C - Producer
D - Tester
E - User
F - Decision Maker
G - Final Product

Chapter Three

RANGE AND SCOPE OF EDUCATIONAL MATERIALS

In Asian countries, a variety of educational materials have been developed and are being used in the schools. For the development of such materials, various raw materials are utilized. There are some educational materials which are common to many countries in Asia. The Workshop examined the range of the materials being used in the participant's countries, and attempted to classify them with respect to possible range of applications and uses.

A. Range and Variety of experiences

The experiences exchanged and the demonstrations given by the participants of the Workshop indicated the widest possible range of educational materials, from the most simple materials made out of bamboo, horse hair, plastic tubing, soap boxes, used ball-point refills, etc. to the most sophisticated systems such as radio and television as well as satellite broadcasting. In between the two ends of the spectrum were materials made by teachers using products such as films, slides, audio tapes, flash cards, cut-outs, models, toys and puzzles for children of all ages.

These diverse examples indicated the complexity of circumstances under which educational materials have been prepared. There were region in Asia where a small school could hardly afford plastic materials. The funds available in such a school were negligibly small and the plastic products had yet to become common items to reach beyond the metropolitan areas. Most countries have started to use the most sophisticated dissemination system of mass media which reaches a large number of school children and teachers. The problem of large numbers may have to be tackled with widest utilization possibilities. Though both models were discussed, more emphasis was made on one which would involve teachers, pupils and the community in using locally available materials and their own resources. This was innovation at micro level. Then there were examples of government agencies involved in production and research on prototypes educational materials. The use of common items such as projector, tape recorder, radio, and television, etc. attempted to reach a large number of users.

It became necessary to consider categorizing these materials as follows:

i) The available materials in the natural environment as well as scraps/discards from commercial and domestic use. There may be freely and easily available. Typical examples are bamboo, seeds, shells, bottle caps, packing materials, fused bulbs, etc.

ii) The available materials which are easily accessible in the environment but the purchase of which could be within the reach of the schools in the rural context. Masks, puppets, battery, bulb or wire are some examples under this category.

iii) The available examples of prototype materials prepared by teachers and specialists for possible wider dissemination. These include charts, simple models or kits which are either distributed by government agencies or sole commercially.

iv) Educational materials which need the use of machines. Films, slides and film-strips require projectors. Audio tape requires a tape recorder. There are examples of models and simple scientific apparatus which are required by the school to show certain scientific processes.

v) Materials such as radio programmes (including radio-vision), television programmes, videotapes and films which most often are made for wider utilization to justify the high cost. Basically these are one way communication, media and their utilization in the class-room depends largely on the teachers skill and competence.

B. Criteria and classification of materials

During the Workshop, emphasis has been laid on educational processes that are involved in designing and producing educational materials with reference to:

i) Human interaction and participation of teachers, children, parents and the community;

ii) Greater understanding of the environment by the children the use of indigenous material from within their environment;

iii) Creative process of the teachers and the children.

It is a common experience that funds available for educational programmes are limited in each country. It is not always possible to provide the teachers and schools with large number of materials. Even in schools of western countries where all kinds of equipment/ facilities are available, greater emphasis is being laid on letting the children interact with their environment in terms of materials and concepts therein. This is based on the assumption that education is an interactive process between the child and the teacher, parent and the community.

It is also significant to understand the levels for which the educational materials are being produced. Freely available materials may be more relevant to the needs of elementary schools because of shortage of funds. Low-cost materials may be easily provided at the secondary school level. In other words, the production of effective educational materials is related to:

i) Funds or money available to the school system;

ii) Involvement and participation of the teachers/children/parents/specialists;

iii) The use of the environment as a base for materials as well as concepts; and

iv) The range, scope and extent of utilization of the materials.

It is obvious that in the case of materials listed in A-(i) and (ii) the involvement and participation of teachers/children/community could be high. Education which is relevant to the environment could be at no cost or very little cost. On the other hand, for A-(v) the cost is high but the breakdown cost per head or use will be low in terms of higher utilization. The factor of involvement of teachers/children is low. The cost factor of A-(iii) and A-(iv) may be intermediate with some involvement and participation of the children.

Thus, the educational materials which can be developed from different materials may be classified in terms of:

i) Freely (no cost) available materials out of the environment;

ii) Accessible and easily available materials with very little cost;

iii) Materials available commercially for large-scale distribution (charts, simple machines, etc.); and

iv) Mass media or distant learning systems (Radio, TV, Film, etc.).

From the categories stated earlier in part A the classification of educational materials may be based on factors such as funds, involvement of teacher, pupils and community, use of resources in the environment and the range of utilization. Thus the use of freely available materials can have a high level of participation and use of the local environment but may have limited possibilities of utilization. The easily accessible materials at low-cost may on the other hand require some funds to be available to the school and yet have high involvement level.

The medium-cost materials may not only require funds to be available in the school but may also require certain facilities and equipment. These include projectors, cameras, tape recorders, record players, and supplies. Purchasing or renting educational materials from a central or commercial agency may considerably reduce local involvement. On the other hand, materials produced by a central agency can reach a large number of schools and teachers. Carefully designed and developed educational materials produced in large quantities for such dissemination may prove to be relatively cheap in the long run.

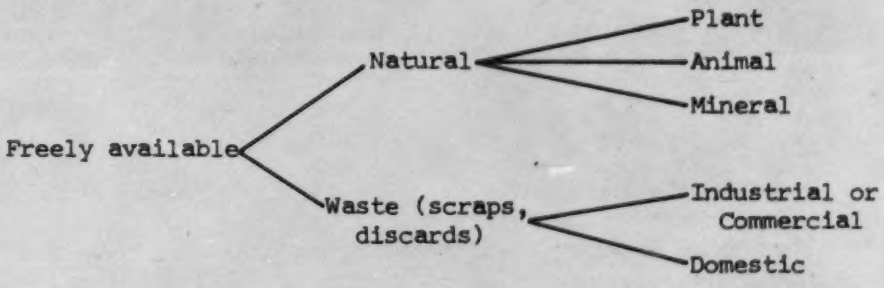
The materials for mass media are invariably produced centrally and often at high cost but they can have the widest utilization. Centralized production may significantly reduce the involvement of the teachers, pupils and the community. A host of specialists (media persons, research workers, etc.) besides teachers may be involved in the production programme.

Low-cost educational materials

The classification and the criteria may be related to each other as indicated in the table below:

Classification of materials	Criteria			
	Money	Participation	Environment	Utilization
a. Freely available	no	pupil/teacher	local	limited
b. Accessible and easily available at low cost	low	pupil/teacher/ community	local	limited
c. Available commercially	medium	teacher/other personnel	partly local	medium
d. Mass media or distant learning systems	high	specialist/ other personnel	not local	widest

A list of materials as classified above is set out below (please see Annex VI, p. xix to be incorporated herein). The classification made is as follows:



The level of application has been categorized as Pre-school (PS); Elementary or Primary (E); Secondary (S) and Tertiary which includes teacher or technical education (TE).

The production of the materials could be done by:

- Teacher (T)
- Pupil (P)
- Community (C)
- or a combination of any two or all of the above.

A list of Low-cost/Simple Educational Materials. (Please see Annex VI) p. xix

Chapter Four

GUIDELINES FOR DESIGNING, DEVELOPMENT AND EVALUATION OF LOW-COST EDUCATIONAL MATERIALS

As already discussed in the proceeding chapters, the development of low-cost educational materials is one of the most crucial areas in the development of education in a sense that this process would contribute in overcoming many of the problems which Asian countries are now facing. The development efforts in this respect should therefore be further strengthened in a number of ways.

Low-cost educational materials have an advantage of offering a "do-it-yourself" approach to the teaching-learning situations, and they bring into the classrooms more humanized and personalized teaching strategies especially in the underprivileged and underserved schools. When teachers and pupils plan, produce or create their own educational materials, they invariably manifest pride and pleasure in utilizing them to the maximum, because such materials are almost certain to be related directly to the objectives of their class activities. Pupil participation in the preparation of educational materials stimulate learning and develop skills in manipulation and production of worthwhile and useful articles. Cooperative endeavours among school administrators, supervisors, teachers, pupils, parents and the community in the production low-cost educational materials could provide breakthroughs in the attempt to solve problems of how to provide the children with the available budgetary allotment and with the maximum use of local resources.

An effective design for a realistic programme of the developing low-cost educational materials should consider foremost, the improvement of instruction for quality education of the children. It should employ the best that can be done with the available materials and human resources to solve present problems in instruction and to meet the desired objectives and needs of the children. It should provide for practical production activities as well as maximum utilization of the finished materials by teachers and pupils. The programme should also include the evaluation and revision of the educational materials on a continuous basis for the improvement and validation of such materials.

A. Toward designing, development/production and evaluation of low-cost educational materials

During the Workshop, it was observed that the processes of actual design and development of low-cost educational materials have some fundamental features in common. These features could broadly be classified under four important aspects for considerations namely: psychological, instructional, materials, and production.

Low-cost educational materials

Psychological aspect

As regards the psychological consideration needed for designing low-cost educational materials, one has to pay due attention to the following factors:

i) the "target - group" that is, for whom it is designed;

ii) the types of experience that would best stimulate the group in terms of their age, intellectual level, socio-cultural background, aptitudes and interests; and

iii) a clear identification of the actual needs for low-cost materials before settling down to the actual designing.

Instructional aspect

It was the unanimous agreement of the participants that designing of low-cost educational materials without due consideration of the real instructional factors related to the product, is of little use. The most important instructional factors that are to be considered in the design process are the educational objectives that the educational materials may help to achieve. These objectives may include, among others, knowledge, skills and attitudes. One has to consider the points such as:

i) How best could these objectives be met?

ii) What would be the best process to transfer the expected experiences to the pupils?

iii) What is the best process that would stimulate the pupils?

iv) Which process would help the pupils to relate the learning experience with their social and cultural environment?

In addition to the above, it was noted that the designer should consider the possibilities of broadening the utilization of the product to the maximum. For example, low-cost educational materials could be utilized in various learning situations, and could make a number of concepts more comprehensible for teaching different disciplines. During the Workshop, the participants recognized the importance of designing multi-purpose low-cost educational materials.

Materials aspect

On being sufficiently enlightened on the psychological and instructional factors that are related to the anticipated product, one may proceed to the actual designing. At this juncture, it is of prime importance for a designer to consider the nature of the final product rather than be influenced by an existing piece of equipment or aid.

A designer, however, may have the freedom to be guided by an existing piece of educational material while considering the possibilities of improving its quality, widening its usability and reducing the complexity of its production process and manipulations. A good designer therefore has to be a "dreamer" who thinks from various angles.

Production aspect

Finally, this is the phase of actual production of the design. Assuming that the psychological and instructional factors are duly recognized, the next step would be to consider the following three factors:

i) material factors;

ii) production factors; and

iii) quality factors.

Material factors to be considered are the availability, cost, and flexibility of use. The last one is essential to broaden the utility value of a material for many or multi-purposes.

At the next stage, the production factors to be considered are:

i) the persons who are involved in actual production work;

ii) skills needed by such persons;

iii) contributions that may be received from concerned persons/agencies - (e.g. for collecting waste and scrap materials from domestic, commercial or industrial sectors);

iv) the machines and the number of operational-phases involved in the production process;

v) the sources of energy that may be needed for completing the product; and

vi) the time needed for producing a unit item.

The quality factors play an important role in the performance and durability of the product. However, throw-away types of materials may also be designed from freely available materials provided that they need the least efforts in reproduction.

When the above sequences are undertaken at an institutional level like an audio-vidual materials centre, an educational technology centre or a curriculum development centre, a prototype has to be produced and tested in actual classrooms. This try-out process should be carefully observed and analyzed not only by the people who are involved in designing and in the production process but also other educators in the field to find out problems and possible solutions for improving the original prototype. This process may be repeated until

an appropriate material is developed and finalized. The final product will be reproduced on a large scale and distributed to schools.

It is expected that all the personnel involved in the design, development and production process would meet regularly to exchange ideas and to conduct evaluations so that the quality of the materials may be improved continuously throughout the process.

The total process mentioned above is simplified and illustrated as follows:

a. Identifying the need	- nature of need - sources of need - cultural background
b. Specifying target audience	- cultural background - level of education - age - urban or rural
c. Defining objectives	- knowledge - skills - attitudes
d. Identifying skills, procedures and techniques for realizing the objectives	- feasibility - suitability/appropriateness - types of materials, e.g. charts, games, etc.
e. Specifing approaches to design	- creating new materials - modifying/improvising exemplar materials
f. Considering raw materials and tools needed	- availability in local environment - cost
g. Identifying the involvement of different people	- skills required - teachers, parents, pupils - community, curriculum specialists
h. Producing prototype	- relevance to curriculum needs
i. Testing try-out model	- cost - time for production - feedback
j. Modifying of the try-out model	- objectives achieved - effectiveness
k. Finalization of the materials	

(Note: The above process is not necessarily to be linear, and a certain portion of the process may be repeated.)

B. Teachers as agents of development of low-cost educational materials

The above process is also applicable in a situation when a school teacher himself develops low-cost educational materials using locally available materials. In this case, a teacher may carry out all the processes either by himself or as a co-operative effort among teachers, pupils, parents and the community. In order to facilitate the development efforts and the use of low-cost educational materials in Asia for improving the teaching-learning activities in the classroom, teachers have to take active part in the development of the low-cost educational materials.

Basic to the design for effective low-cost educational materials is the teachers' thorough knowledge of the objectives and contents of education which contribute to the appropriate changes in the pupils' behaviour. Adequate knowledge of the patterns for learning experiences is another concern whereby the teachers and pupils have specific roles to perform and for each learning situation, there are materials, equipment and environmental conditions that can most effectively facilitate learning.

Teachers who are keen to improve the education of their children prepare their own teaching aids and devices. However, the quality and effectiveness of these teacher-made materials have been limited by the kinds of raw materials available, their limited knowledge of effective visual designs and construction techniques, and the insufficient encouragement from their superiors, parents, and the community. With financial and administrative support, professional help from educational media supervisors and technicians, and the cooperative thinking and efforts of parents and the community, it is possible to produce various types of educational materials.

C. Basic principles for developing low-cost/simple materials

i) A practical step to take in production is to identify or isolate the critically needed instructional materials which teachers alone or the teachers and pupils together can produce out of the available local resources. The production of inexpensive educational materials frees the schools and teachers from over-dependent on commercial and profit-oriented suppliers or producers.

ii) A survey and an inventory of the local raw materials and resources will spark in the teachers and pupils stock of ideas and thinking on forms and types of materials which they can create to solve their instructional problems.

iii) A great deal of research, reading, observation, listening, and purposeful exposures to new ideas, information and types of teaching materials will generate much needed motivation and creative ideas for the production of novel or new educational materials. Improvisation of old devices and the utilization of discarded materials are usually the result of imaginative thinking and resourcefulness.

iv) Start with the simple and easy production techniques or procedures such as learning to draw letters; doing simple sketching; designing simple layouts of posters, diagrams and graphs; and making effective use of the chalkboard, and flannelboard. Such simple skills are fundamental for the production of more difficult materials like displays, charts, puppets, models, mock-ups, etc.

v) Individual as well as group judgement, common sense, resourcefulness and hard work are important factors in the production programme. "Openness" of one's mind to a variety of ideas and principles in the creation of different forms of educational materials is essential for maximum use of indigenous raw materials.

vi) Minimize the production of "one-time" or "one-shot" educational materials as this will prove to be a very expensive venture. Multi-purpose materials, cross media kits and packages will surely induce greater participation and several exposures of the children to the development of meaningful learning experiences.

vii) All low-cost materials must be pupil-oriented to provide for expanding the learning opportunities of children. Maximum participation of pupils and parents in the production of such materials develops better motivation for learning, improves the school and community relations, and ensures economy in the school budget.

D. Principles for effective design of educational materials

The qualities of arrangement, spacing, colour, and overall attractiveness are elements to be achieved in every good educational material. Together they build the design of the visual materials and are usually found in graphic presentations, diagrams, charts, posters, bulletin boards, and other display materials. Good design must be functional.

The following basic principles may summarize the elements of good design for any educational material:

i) Clarity is the key. The central idea must be simple, direct and accurate. It must be legible in terms of layout, size, contrast and colour.

ii) It is compelling. It must attract attention, spark the learners' reaction and promote sharp thinking. Its message must stick; its colour, symbolism, phraseology, and overall form contribute to the lasting impression on the learners.

iii) It is easy to use. It must be simple and easy to be handled, manipulated and understood by the learners.

iv) It is appropriate. The material must reflect its purpose and its form is closely tied to its content. Its form reflects the experience and age level of the users.

v) It is worth what it costs. It must be produced as economically as possible in terms of time, efforts and money. It must produce desired results. Careful planning and familiarity with the various types and purposes of inexpensive visual materials contribute economy in production.

E. Principles for the utilization of educational materials

The key to the effectiveness of educational materials is the wise use of the available materials in the improvement of the learning process. A teacher may use educational materials in the initiation, presentation, development, application and follow-up phase and time of the lesson, and use them in the right way for effective teaching-learning experiences.

The effectiveness of educational materials depends upon the skill and imagination of the teacher using them. There is no magic about them. A teacher may follow this pattern of good teaching practices and procedures:

i) Careful selection - The teacher should examine the materials to find out their suitability or appropriateness to the learning task, ages and abilities of her pupils. The materials should be selected in relation to the learning objectives.

ii) Teacher preparation - The teacher should preview the materials, read the study guides if available, plan the class preparation and follow-up so as to achieve the purposes for using such materials.

iii) Class preparation - The teacher and pupils should discuss the reasons for using the materials, the questions or problems the materials might help solve, the new concepts that might be gained, and the points to look for. The teacher should make sure that the pupils are properly motivated to use the materials.

iv) Presentation of materials - The teacher should have the right materials at the right time. They should be checked and ready for use. The teacher should know how to handle the presentation of such materials before her class.

v) Follow-up and application - The teacher and pupils should discuss the questions or problems suggested in the preparation period; check on the information gained; discuss the parts not clear; and review any part of the media which needs further clarification. Other materials may be used in the follow-up. Tests may be given when needed.

vi) Evaluation of the lesson and methods use - The teacher and pupils should discuss whether the materials helped to achieve the purposes set up during the preparation period. The entire learning experience and the outcomes should be appraised as basis for continuous improvement of the learning processes.

F. Criteria for evaluating low-cost educational materials

For realistic judgement about simple, low-cost educational materials the following questions may help:

i) Will the material be usable in direct relation to a teaching unit? To a specific experience or a problem-solving activity?

ii) Is the content of the material useful and relevant to the learning experiences of the children? Will it increase the depth and richness of their learning?

iii) Does the material stimulate thinking, reacting, discussing, deciding or further study on the content portrayed?

iv) Is the content of the material free of conflicts, distractions or bias? Is it in good taste?

v) Will the material help in the development of wholesome attitudes, values, ideas and concepts?

vi) Does the material facilitate the process of inference, action or sound conclusion?

vii) Is the material accurate, typical, and up-to-date?

viii) Does the workmanship in the construction of the material show careful planning and satisfactory quality? Is it visually strong in verbal, pictorial or graphic design?

ix) Is the material constructed to withstand hard usage and several handling? Can it be used again and again, and in a number of teaching-learning situations?

x) Are the physical size, format and artistic quality satisfactory?

xi) Are the letterings, label or caption on the material legible and comprehensible? Is there no misleading statement or label or caption on the material?

xii) Is the material worth the time, effort and money spent in constructing or preparing it?

G. Production of low-cost educational materials

Only a few of the commonly used educational materials are considered here:

i) Flat pictures

Flat or still pictures are among the most accessible and least expensive of all educational materials. Usable illustrations can be found in most periodicals and magazines.

The following are the guidelines for the selection and preparation of such materials:

a) A picture should present a single, clear centre of interest related to the teacher's purpose. The main idea visualized should be apparent and relevant to the unit under study.

b) The picture should be truthful and presents scenes which are typical, rather than unique or starting.

c) High technical and artistic quality should characterize each picture. Photography, composition, and colour should be attractive.

d) In most cases the picture should stimulate the imagination, through suggestion of new experiences or re-creation of previous ones.

e) A picture should be suitable to the age and background of the pupils.

For neatness and effectiveness in presentation, pictures should be mounted. Mounting is also a means of protection and will ensure longer life of the pictures.

ii) Other flat visual materials

These refer to diagrams, charts, graphs, maps, posters, and cartoons, all of which are symbolic representations or explanations, rather than pictorial reproductions.

a) Diagrams and charts are condensed visual summaries of facts and ideas, clarifying relationships. Charts are orderly arrangements of words and figures, but diagrams

feature lines and symbols. Charts and diagrams are more useful in summary and review than in introduction of materials.

b) Turnover charts or flip charts often include not only charts and diagrams but also pictures, graphs, and whatever symbols may be helpful for the presentation. These are mounted or printed on large sheets which are shown in sequence by flipping them over the top.

In making a chart or a diagram (1) concentrate on key ideas and dispense with non-essentials; (2) use symbols large enough to be seen easily; (3) make it attractive through use of contrast, space and appropriate colours.

c) Graphs are forms of diagrams but they represent numerical data. They include (1) line graphs, probably the most accurate of all graphs and useful in plotting trends, growth, or frequency; (2) bar graphs, useful for teaching the relationship of individual items to a whole; (4) pictorial graphs, using figures of varying sizes to represent large numbers.

d) Maps are another form of diagrams visualizing geographical relationships. If a small map must be enlarged, use the opaque projector technique or the grid method.

e) Cartoon is another graphic form of representing ideas, situations, and relationships; and it's effectiveness depends upon unity and clarity of the visual presentation. Distinctively, however, a cartoon features exaggeration and humour.

f) The feltboard or adhesive board takes advantage of the fact that wool and cotton felt will adhere to like surfaces. On a board covered with felt or napped material various pictures or wood symbols are placed. A presentation can be built up piece by piece, dismantled, and reassembled for review. Children especially enjoy placing the pieces on the board as a story is told.

g) Posters are visual materials that put across an idea in one fleeting glance. They exert great visual power through their qualities of boldness, directness, simplicity and dynamism to drive home their message. The two components of a good poster are:

(1) Pictorial elements which consist of the major illustrations, secondary or supplementary illustrations (optional),

logo - a sign for rapid identification (optional), white or "silence" space, and colour.

(2) Word elements which consist of the headline or statement of the theme or idea, secondary or amplifying statements, and command or the "call to action".

iii) Three-dimensional materials

Some materials add a third dimension to visual images. Their realism offers a supplementary appeal to the sense of touch.

a) Objects and specimens are simply the real things, usually taken from their natural setting to be used by a group of pupils. Objects of art from other civilizations may contribute to inter-cultural understanding.

b) The terms, "model" and "mock-up" are frequently inter-changeably used. Models of various animals are useful in animal study; a mock-up of a clock helps in developing skills in telling time among the children. Both model and mock-up may increase understanding by enlarging small items or reducing the size of unwieldy one.

c) Globes and relief or terrain maps are forms of models. They visualize geographical relationships and may be used for such varying purposes as explaining principles of soil conservation, studying highway problems, or planning a trip.

d) Puppets and marionettes make strong appeal to the imagination, especially of children. Featuring whimsy and fancy rather than realism, they can be used to tell stories at little risk of stereotyping characters. Some types of drama not easily presented with human actors, adaptations of classic plays, visual interpretation of music and development of fantacy are ideally suited to the use of puppets or marionettes.

iv) Use colours

Educational materials in black and white are usually cheaper and more available than those produced in colour. However, in local production discreet use of colours add to the effectiveness of the materials for the following reasons: legibility and visibility, truthfulness, psychological effect, dramatic impact, interest created, colour contrasts, colour coding, and active reaction. Visibility and contrast are two most important points in the use of colour for visual materials. High contrast range is often desirable and good visibility is always a must for all visual materials. Red and orange are colours which have good eye catching qualities for they

activate the nerve endings of the eyes much more than any other colours.

Teachers who have to plan and make-up educational materials must consider the theories of colour which are based on lights and pigments as well as the viewing location and the effects upon the users of the materials.

v) Lettering educational materials

Lettering on visual materials can make or break the visual presentation. Teachers should develop skills in lettering techniques. Lettering brushes, speedball pens, ink, crayons, coloured pencils, and lettering manuals/instructions will prove helpful. Tracing or cutting out suitable letters from newspapers, magazines and advertisements give good effects.

The titling of any visual material is of primary importance. Titles should always be:

Brief - usually two lines, but only one is preferable.

Accurate - saying no more and no less than intended; make them telegraphic.

Arresting - the emotional impact of a visual material can be heightened by the use of appealing work symbols to reinforce the message.

Legible - the spacing between letters, their thickness, or thinness, spacing between lines or words and the arrangement of the parts give the total effect of attractiveness and clean-cutness of the whole message. Legibility also depends on colour and larger letters.

All graphic materials must be properly titled; objects, specimens, models, and other 3-dimensional materials must be labelled to add meaning to their visual impact.

vi) Designing layout format

In planning effective graphic educational materials a good layout is essential. It should have the following elements:

i) Balance - Are both sides of the layout equal? Does one side appear to be heavier than the other?

ii) Emphasis - Decide which parts are the most important and emphasize them.

iii) Contrast - If something is important enough to be included in the layout, it is important enough to be seen. Contrast light with dark and dark with light so that the parts are clearly visible.

iv) Harmony - Do all the parts go together? Does the lettering fit the subject of the visual presentation?

vii) Reference files for layouts and sketches

In the preparation of a variety of educational materials, it is necessary to develop some reference files for layouts and sketches. These serve as basic resource for hand-made graphic materials. Tear sheet files can be assembled from the following:

a) Pictorial, diagramatic and allied graphic contents and cuttings from newspapers, magazines, comics, and other discarded booklets. Some of the most common pictorial magazines for this purpose are magazines,supplements of the daily newspapers, and many other local and foreign periodicals and publications.

b) Pamphlets and pictorial display materials from embassies, tourist information centres and offices as well as dealers of audiovisual materials and equipment.

c) Advertisement materials from government and private industrial agencies.

d) Sets of picture postcards and pictorial cut-outs produced commercially.

e) Tracings of sketches and other pictures from encyclopedias, pictorial books, etc.

The collection of pictorial materials will serve as a rich source of ideas to develop educational materials. Some of them can even be mounted for use on bulletin boards, feltboards, and magnetic boards. The tear sheets may be arranged under different sub-headings according to the different categories of the pictures and illustrations.

Chapter Five

SOME PROPOSALS FOR RE-ORIENTATION AND STRENGTHENING OF NATIONAL EFFORTS

In view of the different ideas and experiences which emerged during the Workshop, a need for rethinking and re-orientation on the issue of low-cost educational materials has been recognized. New approaches and new strategies in relation to the exploitation of locally available resources and their applicability are considered necessary in helping to open new vistas in the teaching-learning processes in the respective countries. This chapter presents the thinking of each country by way of re-orientating and strengthening its own national efforts.

Afghanistan

Based on the experiences shared with other participants during the Workshop the following are some of the steps which could be taken in the country:

i) Further exploitation in the use of indigenous raw materials for the developing educational materials.

The Audio-Visual Department of the Ministry of Education could make greater use of indigenous materials from the local environment. There is an abundance of soft pine wood in the rural areas which could be processed into low-cost educational materials. In some areas where plaster of Paris 'Ghach' is available, such material may be used in making models.

ii) Improving the organization, management and strategies for developing low-cost educational materials.

The existing organizations at Headquarters and provincial levels could undertake experiments in the development of low-cost educational materials for use in schools.

iii) Improving the dissemination and distribution processes.

Measures will be undertaken to disseminate ideas regarding the development of low-cost educational materials to all personnel at all educational levels of the educational system starting from the designers down to teachers. The process of distribution of materials will also be improved so that all schools will receive them in time for their instructional purposes. Feedbacks from teachers on the use of the materials will be observed and made available to the higher authorities in order to strengthen the effectiveness of the dissemination and distribution processes.

iv) Introduction of new materials, methods and techniques applicable to certain activities or projects.

One of the ways to introduce new materials and methods is to distribute hand-outs and guide-books which contain diagrams and notes for teachers. Another way is to organize exhibitions at the provincial level. In-service courses could also be held where information could be disseminated. Inspectors in their visits to schools may also help in this matter.

Bangladesh

Currently the Audio-Visual Education Centre (AVEC), Dacca is responsible for preparing a variety of low-cost teaching materials. But this Centre is not able to serve the needs of all the educational institutions in the country. Hence, the following steps are proposed to improve the situation:

i) The present AVEC should be upgraded to act as a head office for the district level offices. This head office could perform the following:

a) to prepare different teaching aids for distribution to the district offices;

b) to function as a district office for the district where it is situated;

c) to establish a central film library where films could be produced and copies of which will be distributed to the district film libraries.

ii) The district offices could perform the following functions:

a) to organize training courses for teachers in the district to motivate and provide them with appropriate skills in the use and development of low-cost educational materials;

b) to establish a library of films, filmstrips, teaching equipment and samples of low-cost educational materials which can be loaned to schools;

c) to conduct demonstration classes, with the help of films, filmstrips and other low-cost teaching materials.

iii) There is also the need to consider movie films. In view of the number of students that can benefit from a film showing and the many ideas a film can impart that other media/materials cannot, movie films can also be considered low-cost.

India

Education in India is not centrally controlled. The States are free to have educational programme related to their environmental needs. Each State has its own State Institute of Education as well as State Institutes of Science Education and and A-V Department. There are several teacher training institutes within each State. The environment being different in different States, it becomes essential for these organizations in each State to relate the training of their teachers with materials that are easily and freely available in the surroundings. A list of materials should be prepared by each State educational organization and distributed to teachers all over the State. Many teachers who are not aware of their utilization possibilities in their own educational context would begin to realize the importance of using these materials to make teaching-learning processes simpler and more exciting.

The development of educational materials is relatively a simple task but most often not undertaken due to poor management strategies. Three elements essential in the process are : (a) Teacher; (b) Material; (c) Curriculum. The teacher needs to be trained and motivated and the materials identified to relate to the development of educational materials. The experts need to work in close coordination with the bright teachers. Such training programmes must be held at regular intervals at the district level. The newly formed Centres for Continued Education (NCERT) at the district level and the State A-V Units/E.T. Cells could promote this activity. Thus NCERT (Central), State A-V Units/E.T. Cells, Science and Education Institutes need to coordinate at the district levels to establish links between teacher and inspector and State educational authorities.

Educational materials can be developed at four levels: (a) National; (b) State; (c) District; and (d) Individual school level. The more emphasis there would be at the micro level, the wider and more meaningful the development is likely to be. Efforts must therefore, be made to identify the development at school or district level and through newsletters/booklets collate and distribute the information to large number of teachers. Science exhibitions must be built from micro to macro level; the better ones must extend to higher levels. Emphasis should also be placed on the understanding of the concept by the teachers/students in making the educational materials for science exhibitions. State level museums and community science centres with mobile vans should keep on reaching larger numbers of teachers and students.

The development of educational materials is related to the understanding of (a) the concept; (b) the teaching process related to the target audience; (c) the materials; and (d) the technique of manipulating them. In working with rural teachers whose knowledge and exposure are limited, it is not only the question of producing the materials but also the process of interaction and communication. In India where cultural, linguistic and economic diversity is enormous, the question of process assumes great significance. Projects must be undertaken to carry out these activities in remote parts to have a better understanding of the process of communication and thereby meaningful development of low-cost educational materials.

Low-cost educational materials

Indonesia

Provincial centres for production and utilization of low-cost materials

Attempts have been made by the government to keep the cost of educational materials as low as possible through mass production of teaching aids. A number of prototypes have been prepared and tried out and will finally be mass-produced. The utilization of indigenous materials found in the environment for the production of teaching aids has also been suggested, but not many teachers have the necessary knowledge and skills needed for this purpose. So far, opportunities for exchanging of experiences among individual schools and teachers are more or less incidental in nature. It is felt that some kind of Centre should be established in every province to promote the production and utilization of low-cost educational materials which make use of easily available indigenous materials.

The Centre should be responsible for the following:

i) To disseminate information on low-cost materials by publishing bulletins, manuals and newsletters;

ii) To organize and conduct in-service courses and workshops on the design and development of low-cost educational materials;

iii) To collect and record selected prototypes; and

iv) To encourage exhibitions and competitions between schools.

To meet the purposes mentioned above the Centre should also establish a workshop equipped with machinery and tools for wood, metals, glass and plastics works.

In its operation the Centre should maintain good cooperation with other agencies related to educational development such as pre-service and in-service teacher training institutions and the educational facilities units. It is therefore essential that the Centre should be attached administratively to the provincial office of the Department of Education and Culture.

National centre for educational material development

To coordinate the work of the provincial centres a national centre should be established.

i) To collect and disseminate information on the development of low-cost materials to other provinces and all schools in the country;

ii) To collect selected samples of low-cost materials for mass production and distribution;

iii) To organize and conduct seminars, in-service courses and workshops;

iv) To publish bulletins, newsletters or manuals for national dissemination; and

v) To translate selected information from English into Indonesian language or vice versa for the purpose of dissemination and exchanging of experiences and knowledge.

To maintain effective coordination and operation the national centre should be attached to one of the following offices:

i) Office of Educational and Cultural Research and Development (Indonesian: BP3K)

ii) Directorate-General of Primary and Secondary Education

iii) Directorate of Education Facilities (Indonesian: Direktorat Sarana Pendidikan)

Iran

The Centre for Educational Technology in Mashad is carrying out a number of experiments in the field of educational media as well as the development of low-cost educational materials. Many of these materials are exposed to teachers during pre-service and in-service training. The development of low-cost educational materials needs to be given a prominent role in the activities of Mashad Educational Technology Centre.

During this Workshop a survey of indigenous materials in terms of their accessibility, stages of development, modes of production and their scope of utilization was compiled as vital information for organizing similar workshops in Iran.

The activities of such workshops can be disseminated in the following ways:

i) Training courses for a number of instructors who in turn will also run workshops and training courses of these same nature for teachers.

ii) Recording the organization and activities of such workshops on video-tapes and duplicating them for further use by other workshops in other places.

iii) Producing simple and low-cost self-instructional kits which will contain necessary information in the forms of mimeographed copies, and pictures such as charts and instructional sheets.

iv) Integrating such programme in the actual curriculum for teacher training colleges.

Steps will also be taken to carry out proper evaluation on the development, production and utilization of educational materials. One form of feedback on these materials will be through exhibitions, workshops and in-service training courses.

Low-cost educational materials

Japan

Further use of indigenous materials

In order to further mobilize the use of indigenous materials for developing educational materials, the following could be suggested:

i) Foamed polystyrene

Cut-out letters, three-dimensional models, board, screen, tangrams, etc.

ii) Plastic straws

Highly sensitive balances, three-dimensional models with pipe cleaner.

iii) Plastic pipes

Toys (jumping and splashing, woodpecker, hand-made generator, etc.)

iv) Plastic mirror

Kaleidoscope, optical equipment, etc.

v) Velcro tape: Magic tape

Three-dimensional models, bulletin board, test-tube holder, etc.

vi) Metal wires

Toys (up-side-down top, mini-jet-costar, etc.)

vii) Milk-carton-box

Light source box, observing box, measuring box, etc.

In short, any material could be used as educational material with the teacher's creativity and imagination. Teachers should try to venture beyond the realm of "common sense" alone and use creative imagination to try out new ideas towards developing innovative educational materials.

Improving organizational management and strategies for developing low-cost materials

Each school could organize mini-workshop equipped with simple transparency makers, duplicating tools, simple drill machines, solders, etc. The Ministry of Education and other educational organizations should support such school efforts.

Each school teacher could distribute a "classroom activities" bulletin every week (if possible) which may include the following information:

> "Last week we did the following activities ... Next week we would like to do the following activities in my classroom and we need: tin cans, milk cartons, etc. My dear parents, I would be most obliged if your child could bring any of these materials to school"

Improving dissemination and distribution processes

For every educational material developed there should be an instructional manual. It should be fully illustrated so that school teachers could understand how to make them and how to use them.

In Japan, all educational technology centres and the National Institute for Educational Research Centre (NIER) dealing with educational materials should play an active role in improving the dissemination and distribution processes.

Republic of Korea

A number of favourable innovations could be suggested to bring about improvements in the existing educational practices of the country with reference to educational materials. However, it is felt that these innovations would invariably be governed by the national educational policies. Anticipating a fair response from the bodies that are involved in defining the national educational policies, the following proposals could be made in order that we may improve our potentials in using low-cost educational materials in our schools:

i) Establish an educational materials and information centre attached to the Ministry of Education. This centre would take a major role in developing educational materials, disseminating the information on the production of low-cost materials and conducting researches on actual production of low-cost educational materials.

ii) Select at least one school in every school district and assign them as project schools. These schools could develop low-cost materials and utilize them into their teaching, and also organize exhibits of the materials developed by these schools with instructional guides for the other teachers and schools in the same district as well.

iii) In-service training/seminars/workshops on actual production of low-cost materials for teachers, teacher educators, educational specialists, and other personnel who are involved in producing educational materials. These activities should involve local manufacturers, so that they could come up with ideas and designs, and put them into mass production.

iv) Provide a work area for the teachers at the district level audio-visual centres. Raw materials and other technical instruments should be freely available. Here, teachers can develop their creative ideas into the production of educational materials.

v) Provide special shopping areas for teachers where they can buy necessary raw materials required for making educational materials. This system could be operated by the Korean Teachers Mutual Fund, so that profits made could go back to the teachers who had bought the materials.

vi) Organize exhibits of the materials which are developed by the teacher educators and students for their instructional purposes with the appropriate information brochure with the full list of illustrations, at least once every semester.

vii) Use the existing school radio-broadcasting system to disseminate the information on the development of the low-cost materials. Detailed information sheets with illustrations should be provided before the programmes go on the air.

viii) By 1981, every school in the entire country will be able to have instruction through TV. Therefore, TV can also be utilized as a means of disseminating the information on the development of low-cost materials. Actual process of developing the materials can be seen on the TV. Instructional guides should be given before the programmes are broadcast.

Malaysia

Since the establishment of the Curriculum Development Centre in 1973 the focus of activity has been on substituting expensive teaching-learning materials with inexpensive ones. But the questions of management, diffusion, replenishment, and storage have also been given due consideration. However, from the interactions with other participants in the current Workshop we also began to see the need for embarking on a new thrust especially in the four areas stated below:

i) The use of indigenous materials:

a) Make a systematic survey of the indigenous materials that can be used for developing educational materials.

b) Take steps to decentralize the development of materials - teachers, parents and local craftsmen in the different parts of the country should be given encouragement and guidelines.

c) Encourage professional development of prototypes, choosing designs where indigenous materials can be used.

ii) Organizational management:

a) Ensure that educational technologists are included in any team set up for curriculum development projects.

b) Increase the professionalism of the educational technologists by giving them suitable training and opportunities to visit places where good educational materials are developed.

c) Organize periodic seminars on educational technology nation-wide so that there is co-ordination and fruitful exchange of ideas among all those concerned with designing and developing educational materials.

iii) Dissemination and distribution:

a) Provide resources to publish a periodic bulletin on educational technology that can be supplied freely to teachers, teacher educators and others.

b) Encourage visits to schools so that material developers have more direct contact with teachers and pupils.

c) Put indirect pressure so that research articles on educational materials are written by the educational technologists and presented in seminars or published in Journals.

iv) Innovations:

a) Provide avenues where the new ideas find their place in curriculum projects.

b) Staff the educational technology unit with people who manifest some creativity and imagination and with the necessary expertise.

c) Keep the material developers in active contact with curriculum projects where the need for innovative ideas is greatest.

d) Pose the material developers with challenging projects and give them the responsibility to come out with new ideas.

Nepal

Production

As a result of the in-depth discussions during the Workshop, it appears that a new thinking on various aspects pertaining to the design and development of low-cost educational materials is necessary in Nepal. Bearing in mind the economic and topographic features of the country, the following steps will be taken:

i) Self-made:

In this category, it would only involve such items which could be easily assembled by the teachers and pupils who are directly involved in the teaching-learning processes. The materials available in the environment and scrap materials would be used in the process with the help of brief guidelines. Materials like flashcards, hand-made science tools, toys and games (to be integrated in the teaching-learning process) could be included in this category.

ii) Institutional:

Items like charts, graphs and simple science equipment and learning kits with definite objectives come under this class. In the production of these items which are essentially technical in nature because of the skills and the materials involved, the need for special facilities is quite obvious and very necessary. Also in the process of these materials, stress should be laid to the further expansion of such facilities.

Dissemination

Due to the country's geographical feature, dissemination becomes a real problem. However, in order to move along with time and to operate within the existing limitations, measures could be undertaken to speed up the process.

i) For the rapid diffusion of ideas of self-made type of education materials in the rural areas, the following steps would be relevant:

a) "A short course on basic guidelines for preparing teaching aids" should be included in the curriculum of teacher and school inspector training. As these people are directly involved in the teaching and learning process, they could easily function as the main agents of dissemination.

b) "Publishing of Hand-outs". A brief but concise booklet or leaflet containing the process of simple techniques could be published by an educational agency (Science Equipment Centre in the case of Nepal). And the booklet would be distributed to all the levels of school activities for wider diffusion.

c) Organizing Seminars. Frequent seminars either in district levels or zonal levels could be held in order to acquaint the relevant people with the latest development on educational materials. This process would help to permeate the ideas down to the rural level.

ii) At present there are some commercially produced educational materials available in Nepal. However, the cost of these materials are quite high and beyond the reach of the rural schools in Nepal. Also due to the geographical factors the state of distribution is not satisfactory. In order to overcome these constraints, it is proposed that:

a) The cost of production be minimized by using the cheapest type of materials available and by being more labour intensive.

b) The present practice of sending educational materials to remote district headquarters needs to be restructured and made more systematic and effective.

Philippines

In this Workshop the participants have been extensively exposed to the varied experiences and problems on the existing state of development of low-cost educational materials in each member country. The discussions and ideas shared from each presentation have sparked broader perceptions for a more effective national re-orientation programme relating to the development of low-cost educational materials for the improvement of quality of education in the country.

The following approaches are hereby presented for possible follow-through of this Workshop on low-cost educational materials:

National/Regional/Division mobilization on the use of indigenous materials for development

The environment is rich with indigenous materials which can be utilized in the development of educational materials. The potential of most of these materials for development may be achieved through:

i) A survey of materials indigenous to the local environment for possible production of educational materials. The school district will consolidate this report and submit it to the school division. The latter will compile and consolidate such reports to be submitted to the regional office and finally submit it to the Department of Education and Culture. Based on these reports the Department of Education and Culture will conduct a workshop at the national level on the use of these indigenous materials. Follow-up workshops will then be held at the regional, division, district and local school levels on the utilization and development of these materials.

ii) Another alternative would be to ask the teachers/children to bring samples of raw/scrap materials native to their environment. The teachers in the school will identify these materials according to kind or usability. A local workshop will then be conducted to find out the possible uses of these materials in developing teaching materials which will meet their local teaching-learning needs. Exemplar educational materials that have been developed will be chosen and exhibited at the district level. The district in turn will hold a workshop to develop/modify or improve the exemplar materials or create entirely new ones. This will be followed by similar workshops and exhibitions at the division, regional and national levels.

Low-cost educational materials

Improve the organizational management and strategies for developing low-cost materials

i) A national team composed of subject areas and educational media specialists, general education supervisors, curriculum writers, designers, etc. may form a group to plan and execute the development and production of low-cost educational materials.

ii) Educational media supervisor for each of the school divisions should be appointed to take overall charge of an effective implementation of the development programme on low-cost educational materials.

iii) Organize/activate learning centres throughout the country. This innovative facility would surely step-out the maximum utilization of educational materials both for formal and non-formal education. Available book and print media and audio-visual materials will be made readily accessible to teachers, pupils and parents to improve the overall educational level of the community.

Set up dissemination and distribution system

To improve dissemination and distribution processes the following ways may be considered:

i) Organize seminar-workshops to disseminate ideas/ experiences on the development and use of indigenous materials in the production of low-cost materials.

ii) The Philippine Association of Audio-Visual Educators (PAAVE) may publish a quarterly journal or brochure on new ideas, articles and techniques of production and dissemination of ideas on low-cost materials.

iii) Issue department circulars, memos and bulletins to the field on the development and use of indigenous materials for educational purposes.

iv) Contribute articles to other publications and magazines on the development and use of these indigenous materials.

v) The logistics of distribution may start from the Department of Education and Culture to the Regional Directors who will in turn through the Educational Media Supervisor see to the proper distribution process down the line.

vi) Regular annual conference and exhibitions of the PAAVE to exchange new ideas and experiences on the development and use of indigenous materials.

Introduction of new materials, methods, etc.

This approach may be achieved through:

i) Seminar-workshops to introduce new ideas and methods, techniques, etc.

ii) Exhibition of new teaching materials that have been developed from the indigenous materials native to the place. The exhibition may be held on the school, district, division, regional and finally on the national level.

iii) A brochure on the development and use of these materials be published and distributed nation-wide.

iv) Competition and prizes for the best exemplar educational materials developed with the use of scraps or indigenous raw materials available in the area at the lowest possible cost.

v) New materials that have been developed will be tried out on experimental basis in pilot schools to find out their relevance and effectiveness in the teaching-learning situations.

Singapore

In Singapore today, more teachers are beginning to prepare and develop their own instructional apparatus using low-cost materials. However, a lot more needs to be done to encourage all teachers to produce their own teaching aids and devices. There is still media-resistance among teachers as the production of instructional materials, whether sophisticated or low-cost, is time consuming. It takes a motivated and committed teacher not to be deterred by this. To assist teachers in their development and utilization, the following procedures already in existence may be further emphasised:

i) Mobilizing the use of indigenous materials for education:

a) There should be further development of awareness of the usefulness of the indigenous materials by encouraging teachers to visit exhibits of such materials which are being used for the preparation of low-cost instructional teaching aids. These could be organized within the class, the school, educational institutions and the community.

b) Greater encouragement should be given to involve children and the community in collecting locally found materials for utilization in the production of instructional materials.

ii) Improving organizational management and strategies for developing low-cost materials:

a) There should be closer cooperation between the various educational agencies involved in the preparation and utilization of low-cost materials in order to increase the awareness among teachers of the importance of this medium in helping children to learn more effectively.

b) More in-service courses for teachers at the various educational agencies and more workshops in schools using existing available equipment should be conducted.

c) Increasing the frequency of supervisory visits and demonstrations by Media Advisors to schools would also be of great benefit.

d) The continuous evaluation by Singapore Educational Media Service (SEMS) of its own materials is a helpful means of promoting interaction and feedback on the development of low-cost materials.

e) There should be better facilities and more manpower for SEMS Instructional Materials Library.

f) More informal "Meet the Users' Session" for school principals and AVA coordinators could be organized to enable them to view materials acquired by SEMS and to discuss their effective utilization.

iii) Improving the dissemination and distribution processes:

a) All educational agencies who at present share experiences and exchange ideas regarding the selection, production and utilization of instructional aids through information, display and exhibition should continue to do so more frequently.

b) Departments responsible for information through publication of bulletins, newsletters, magazines, hand-outs or guide-books should attempt to achieve as wide a circulation as possible.

c) Seminars, workshops and conferences should be continued to study the existing system of production, utilization and distribution.

d) More publicity should be given to on-going projects, activities and experiences relating to production of educational materials in schools.

e) Contests or competitions could be further promoted.

f) Attachments of teachers to schools or centres with special production programmes should be encouraged to improve their knowledge of the processes involved.

iv) Introduction of new materials, methods, techniques which may apply to activities, projects or other efforts.

This is the concerted efforts of both the Institute of Education and SEMS by providing in-service training and workshops. To motivate teachers further, the steps and exercises mentioned above are applicable.

Sri Lanka

From the observations made at the Workshop it was apparent that Sri Lanka is already heading towards favourable goals as regards the design and development of low-cost educational materials especially in certain subject areas. Yet much remains to be done to improve the existing educational practices and to exploit the available resources and talents of local personnel. It was felt that these innovations for a more sustained and broad-based low-cost educational materials programme would invariably be governed by the national educational policies. A fair response from the offices concerned would therefore be a very great impetus to develop a fruitful national low-cost educational materials programme. Some anticipated programmes for promoting low-cost educational materials may constitute new projects which would involve persons of different administrative strata as the following:

i) Educational policy makers;

ii) Educational administrators;

iii) Teacher educators; and

iv) Teachers.

Some useful suggestions:

i) Expanding the existing equipment design programme by improving the facilities and better utilization of funds set aside for the programmes. Also by providing the personnel involved in designing, opportunities to enrich their skills and experiences and exposing them to similar development programmes in other parts of the world.

ii) Establishing a well-organized educational materials centre and making the available facilities easily accessible to all teachers and teacher educators through a systematic distribution and loan programme.

iii) Setting up a unit to handle the information regarding low-cost educational materials which would invite creative teachers and similar persons to forward their ideas which would be disseminated through newsletters or bulletins to other teachers, giving due recognition to the original contributors.

iv) Organizing a project which involves a number of pilot schools in the initial low-cost educational materials programme.

v) Introducing the production of low-cost educational materials as a subject to be taught in teacher training colleges.

vi) Existing in-service training programmes should be broad-based, more regular and multi-disciplinary.

vii) Exceptionally creative teachers should be appointed and placed in positions where their talents could benefit a large number of schools.

viii) Opening up Regional Educational Materials Centres from which teachers could obtain unrestricted supply of inexpensive raw materials and similar needs.

ix) Organizing national competitions in the field of low-cost educational materials and awarding attractive incentives to winners. The competition may originate from the classroom level where even the pupils may have a chance to utilize and develop their creativity.

x) Providing a sufficient work space and free time to teachers and teacher educators in their institutions to produce their own low-cost educational materials.

xi) Organizing programmes to exploit rural resources, personnel, talents and 'village technology' to produce low-cost educational materials. A project to improve the condition of educational materials in the rural areas may be inaugurated.

xii) Using the mass media through radio and newspapers to make the low-cost educational materials concept popular among local specialists, technicians, producers, craftsmen, parents, teacher educators, teachers and pupils. In this way it would be possible to bring about a positive awareness about the true potentialities of low-cost educational materials in the classrooms.

Thailand

The Ministry of Education in Thailand has approved the new National Education Plan since 1975. Under this plan, not only the 6-3-3 system has been adopted but also is a great change in the school curriculum. The Curriculum Development Centre views the new curriculum as a more integrative type with genuine emphasis on child-centred teaching-learning activities, hence calling for a tremendous effort in the design, development, utilization and dissemination of instructional materials and related matters. An efficient re-organization of the exising systems for the dissemination and distribution of the materials must be undertaken by responsible agencies. Certainly, since Thailand is a developing country, the low-cost instructional materials should be of central issue for consideration.

Many organizations within the Ministry of Education undertaking responsibilities in the development and dissemination of educational materials need to be re-adjusted in certain aspects. Coordination and cooperation between the Curriculum Development Centre personnel and the educational technologists from the Centre for Educational Innovation and Technology, for instance, should be re-examined.

Along this line of thought and many others, suggestions for the improvement of the systems pertaining to the effectiveness of production and distribution of the materials may be as follows:

i) A close coordination and cooperation among parties concerned in the design and production of prototypes educational materials within the Ministry of Education must be strongly established.

ii) The Ministry of Education, through proper channels, should encourage individual teachers, pupils, parents, schools, teacher colleges and other institutions in regard to the original design of the prototypes so that they may be put into mass production and the contributors rewarded.

iii) The production of the materials, after the processes of tryouts and revisions, should not be confined to the Ministry's affiliating agencies only. Commercial agencies should be requested and encouraged to take part in the production of certain materials.

iv) Local production or teacher-made materials should be promoted for teachers or other school key personnel through frequent in-service training programmes at all levels of education. Curriculum personnel, educational supervisors, and university and teacher college resource persons should be drawn to assist in the programmes. This also should be undertaken in the area of utilization of the materials. Moreover, manuals, exhibitions, demonstrations, and school visits can also be used effectively. The existing radio and television networks must be included for the task.

v) Schools or a group of schools should establish a central service centre under the responsibility of a trained educational technologist provided by universities and teacher colleges.

vi) The dissemination and distribution of the materials and information should be linked up with organizations within the system through mass communication networks and in lines of authority.

vii) Feedback system should be established so that each level of authority and organization concerned will benefit in re-adjusting itself for better management of the process.

viii) Research work especially in the Curriculum Development Centre should receive due attention in every phase of design, development, utilization and dissemination of the educational materials. The findings of such research studies should use for the purpose of quality improvement.

ix) The introduction and promotion of new materials and methods of instruction for the teachers should be made by the Centre for Educational Innovation and Technology. Modules, programmed texts, instructional or learning packages, learning-centre classroom, methods of self-discovery and the like should be prepared for teachers. University personnel as well as personnel from the Centre can make great contributions toward the achievement of the above activities.

x) Lastly, programmes and projects within individual schools, community school system, educational organizations and agencies in charge the production, utilization and distribution or dissemination of the materials should be properly and sufficiently funded.

ANNEX I

AGENDA

1. Inauguration of the Workshop and Election of Officers of the Workshop

2. Consideration of the Agenda and Provisional Schedule of Work of the Workshop

3. Experiences of the Asian countries in the development of low-cost educational materials, etc.

4. Examination of the range and scope of existing improvised materials in the countries

5. Consideration and analysis of trends and problems for the development and utilization of low-cost educational materials

6. Designing, development and evaluation of low-cost educational materials

7. Suggestions for re-orientation of national efforts

8. Consideration and adoption of the report of the Workshop

ANNEX II

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ANNEX III

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Dr. A. Latif (Unesco)
Dr. Thamrong Buasri (Unesco)
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MEMBERS OF TASK FORCE A

Preparation of

i) Suggested guidelines for summarising country reports.

ii) Suggested topics for discussions: Agenda item 5.

iii) Suggested outline of Workshop Report.

Dr. Pruang Kumut (Thailand) - Chairman
Miss Salvacion P. Navarro (Philippines)
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Preparation of suggested topics for discussion: Agenda item 4.

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Preparation of suggested topics for discussion: Agenda item 6.

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MEMBERS OF TASK FORCE D

Preparation of guidelines for preparing suggestions for re-orientation of national efforts.

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Dr. Thamrong Buasri (Unesco)
Mr. R. Watanabe (Unesco)

GROUP MEMBERS FOR AGENDA ITEM 4

Examination of the range and scope of existing improvised materials in the countries

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Mr. Soemartono (Indonesia)
Mr. Tan Tin Su (Malaysia)
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GROUP MEMBERS FOR AGENDA ITEM 5

Consideration and analysis of trends and problems
for the development and utilization of low-cost educational materials

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ANNEX IV

INAUGURAL ADDRESS

by

The Honourable, Tuan Haji Salleh bin Jafaruddin,
Deputy Minister of Education, Malaysia

Pengerusi, Jawatankuasa Organisasi Bengkel, Yang Berusaha, Encik Abdul Aziz bin Ismail, Timbalan, Ketua Pengarah Pelajaran, Dr. Latif, Chief of ACEID, Bangkok, Daif-daif yang kehormat, Tuantuan dan Puan-puan sekalian.

Saya berasa sangat-sangat sukacita berada bersama-sama di majlis pada hari ini dan berasa sangat-sangat bangga kerana telah dijemput membuka dengan resminya Bengkel Rantau Asia berkenaan dengan Perkembangan Bahan-bahan Pendidikan Berharga Murah yang dikelolakan oleh Pusat Perkembangan Kurikulum, Kementerian Pelajaran Malaysia dengan kerjasama Asian Centre of Educational Innovation for Development (ACEID) Bangkok.

(I am pleased to be here today and I feel deeply honoured to be called upon to open this Asian Regional Workshop in Educational Technology with Special Emphasis on the Development and Utilization of Low-cost Educational Materials, organized jointly by the Curriculum Development Centre, Ministry of Education, Malaysia in close collaboration with the Asian Centre of Educational Innovation for Development (ACEID) Bangkok.)

First of all, I heartily welcome all the distinguished participants from abroad and my dear friends and colleagues from the Unesco Secretariat in Bangkok. I do hope your brief stay in Malaysia will be interesting and an enjoyable one.

As we are all aware, the purpose of this Workshop is to enable participants from the Asian countries to understand issues and problems involved in the design, production and utilization of low-cost educational materials. With such an eminent gathering of educators, scholars and project directors, I am confident that the discussions and exchanges of ideas and views over the next few days will give added stimulus to the further development and utilization of such materials; and in doing so, contribute toward extending educational opportunity and improving the quality of education in Unesco Member States participating in the Asian Programme of Educational Innovation for Development (ACEID).

Low-cost educational materials

The theme chosen for this workshop is significant for it given due recognition to the fact that, due to resource constraints, implementation of educational innovations is to a large extent dependent upon a country's capacity to design, develop and utilize low-cost educational supporting materials which has to take into account the local environment and the availability of resources. In developing countries like ours, the growth of educational facilities is one of the key indicators to economic progress. In the Asian region alone, 41% of the population is under the age of 14 and the proportion is still on the increase. The provision of low-cost educational materials at a pace fast enough to cater for the need of the ever-increasing young majority, becomes a matter of the utmost importance. In view of the immense problem before us, we need to make a determined effort towards the increased development and utilization of such materials. I believe considerable efforts have already been made to meet these demands over the last few years. During this time, several APEID activities in the programme areas of Curriculum Development, Teacher Education, Science Education and Educational Technology have helped to promote the exchange of experiences, training of personnel and co-operative development of such materials relevant to these programme areas. Following a period of unprecedented educational expansion in this region, this Workshop provides a timely opportunity for participating project directors and educators to take stock of the achievements and innovations of the last few years as a prelude to the consideration of ways of improving and sustaining this improvement in the development and utilization of low-cost educational materials in future.

It is natural that as a result of the feedback from activities that have steadily grown in terms of effectiveness, quality and scale in recent times, a vast collection of experiences and insights literally spanning the Asian region has been accumulated. This in turn reveals many interesting and useful aspects of progress and successes encountered, as well as how the processes involved in the development, distribution, and utilization of educational materials have taken place. But if the personnel and institutions that have jointly been involved in this venture were to derive returns from all the investments that have been made, in terms of viability and usefulness, it is necessary at this juncture to deliberate seriously on how new methods and techniques in material production and utilization can be employed in order to ensure that these efforts are effective and related to the teaching-learning activities outside and within a classroom environment. This means that those in charge of such activities have a great responsibility towards designing educational programmes and their related supporting materials which can keep pace with, and even anticipate, the changing needs of children and of the environment they live in. This implies that our educational innovators and technologists should always be able to modify their programme activities and strategies constantly so as to provide the best possible preparation for the children in the classroom today towards playing their respective roles in the future, as envisaged by their national development planners. In reviewing the current efforts and products, there is a great need to explore new approaches, to seek new strategies and directions in designing low-cost educational materials, using the environment and mobilizing local talents and resources to ensure effective implementation of educational programmes supportive of the national development goals.

During the last decade, Unesco has made a sizable contribution towards the advancement of education in the Asian region. Malaysia has been as fortunate as other countries and has benefited from the expert services, training facilities, financial aid, and equipment provided under the Unesco programme for the qualitative improvement of education. Furthermore, Unesco has helped in bringing project directors and educational experts together in regional workshops like this one to identify areas of common concern and to set targets for more systematised plans of action. The value derived from this varied programmes of activities naturally depend upon the specific educational needs of each country in the light of its own national priorities. But I have no doubt that if Unesco continues to show the same alertness to the changing patterns of Asian educational needs as it had during the last decade, the relevance of its educational programmes designed for the Asian situations will continue undiminished in the years ahead.

I trust that all of you will benefit from this exchange and sharing of experiences amply provided by this workshop. Concrete meansures need to be taken in your own national setting for expansion and reorientation of programmes relating to development and utilisation of low-cost educational materials as this subject is of crucial importance to enhancing the quality of education in the years to come. And now it gives me great pleasure in declaring open this workshop. Thank you.

ANNEX V

The Development of Low-cost Educational Materials
The Role of The Present Workshop

by

Miss Asiah binti Abu Samah

In most Asian countries several innovations have been undertaken in both the areas of formal and non-formal education. The need for innovations on basic functional education with emphasis on health and nutrition, skill development and rural transformation has been increasingly recognized. In order to promote the successful and effective implementation of innovations, considerable attention and efforts have been made in the development of educational materials. It has been recognized that because of the resource constraints, the implementation of these innovations would, inter alia, depend largely on the national capacity for designing, developing and utilizing effective low-cost educational materials and use of environment and local resources. This approach has been particularly emphasized, for apart from being economical, it has also the added advantage of relating education to the real-life situation of the learners. This attempt has resulted in interesting curricula changes with an attendant productivity in different kinds of educational materials. We could say now that there is considerable experience among the educationists in the Asian countries in the process of designing and utilizing educational materials that could be shared profitably.

Developing educational materials is a complex task where teachers, pupils, parents and other educational personnel have their own contributions to make. The materials designed must be practical and feasible and the techniques proposed for its utilization acceptable to the pupils, teachers and the community as a whole. The techniques chosen and the materials designed being means for translating the curriculum objectives into meaningful teaching-learning activities, have also to be effective. This is particularly so in the developing countries where education is seen as the major means of bringing about changes in the nation without losing continuity with its own cultural traditions. This means first of all there is a necessity to evolve a systematic approach towards developing educational materials where due attention is paid to the learning styles of children as well as the processes of socialization they experience. Secondly it also means that perhaps more than elsewhere in the educational system, the development of educational materials and the proposals for utilizing them requires the cooperative effort of not only the specialists but also the pupils, teachers, parents and others in the field of education.

Considering the enormous complexity of the task, it should not be surprising that there are many problems and gaps between how it ought to be done and how it is being done. In the consideration and analysis of the problems and trends for the development and utilization of low-cost educational materials, there should be focus on identification of the specific problem areas and the nature of obstacles towards a more systematic way of designing and developing the necessary educational materials. Attention has also to be focused on a systematic approach to reviewing the current efforts and products and exploring new strategies and directions for designing low-cost educational materials.

A perusal of the various papers presented, reports of plenary sessions and resolutions made in many seminars and workshops on educational technology during these last several years gives an impression that matters of production and distribution are the dominant problems associated with educational materials in Asian countries, as well as many other developing nations. Various economic ways of producing and distributing have been proposed and discussed. The bulk of the thrust has been in the direction of encouraging teachers to improvise the materials needed using for this purpose whatever indigenous raw materials they can get hold of. Other modes of production such as centralised large scale production by the Ministry of Education, designing prototype in the curriculum centres and leaving large scale production to local entrepreneurs big and small, encouraging technical schools to produce materials in the course of their training programmes, etc. have also been discussed at length. The different possible ways by which schools can get the materials have also been considered extensively. Those familiar with the educational practices in different Asian countries will realize that in view of the different levels of economic constraints and degree of industrial development, there is no one uniform method of producing and distributing common to all countries.

There is still plenty of scope for further thinking in the areas production, distribution, storage, maintenance and replenishment of materials.

Another area which should be considered is the innovative use of existing materials. A set of educational materials has the potential of being used in a number of different ways. For example, wooden cubes are a familiar thing, but the imaginative use of them for teaching mathematical concepts like sets and factorisation is novel. Creative thinking of this kind, that is specifically a search for novel uses of existing materials must be greatly emphasized in virtue of the economic constraints many Asian countries experience.

An integral part of material development is on-going evaluative study of these products, to answer such questions as: Does it interest the child for a sufficient length of time? Does the material lead the child towards abstraction from a number of empirical observations? Are there other alternative teaching-learning strategies which could be more effective? These questions and issues should be considered for the continuous improvement of the materials being developed. The systematic collection of evaluative data both from teachers and the pupils is not yet, on the whole, a well established

practice in materials development in most Asian countries. On-going evaluative studies of materials designed in connection with a particular curriculum project during the trial period itself is rare. If any evaluative study is done at all, it comes only as a component of the summative evaluation of the curriculum project as a whole.

Educational materials cannot be considered independently of the instructional teachniques which translate a curriculum objective into an educational activity. Such terms as programmed instruction, discovery approach, child-centred approach are boroad terms which signify a body of instructional techniques with a unifying theme. Techniques occupy a central place in the instructional process, and the success of a curriculum project will to a large extent depend upon the suitability of the techniques proposed which take into account the psychological and sociological factors of child development. In many Asian countries, the problem to supply basic educational materials to schools has occupied so much time and attention, that sufficient attention has not been paid to the techniques with which the materials are used. However there appears to be a trend towards increased focus not only on the products but also on the techniques which guide the usage of the materials. This trend should be encourage and the instructional techniques should also become one of our basic concerns.

There is rapid development of new products and processes which may be highly relevant for the development of more effective and economic educational materials. Unfortunately, many countries are not able to take advantage of these innovations due to the predicament of professional educators within the policy-making bodies in the educational system. Due to various constraints the professionals in education are usually not in a position to think ahead enough into the future and anticipate national educational needs, say five years hence. Thus, they are seldom ready with suggestions and solutions when the need arises. Also researchers in education have been more concerned with describing the learning process and other related issues, rather than being concerned with patterns of responses and reactions of children when new curriculum projects are implemented. It is time that educators begin to be futuristic in their thinking. They must continuously acquaint themselves with new technological advances and investigate how these innovations can be utilized in some aspect or other for the purpose of curriculum renewal.

Concluding Remarks

Most countries in Asia have already spent many years in the process of developing low-cost educational materials. There is a wealth of experience and knowledge about the problems and prospects which can be fruitfully utilized for evolving a more systematic approach to developing such materials. This workshop will provide an opportunity to share our experiences and to learn from each other so that we can identify the various problems, issues and trends and collectively plan a strategy for overcoming them. We should not only be critical but also perceptive and creative so that we come a bit closer to the ideal in designing and developing low-cost educational materials for the betterment of the community and the nation.

ANNEX VI

A LIST OF LOW-COST/SIMPLE EDUCATIONAL MATERIALS
USES AND MODES OF PRODUCTION

Materials Classification	Application	Levels*	Mode of Production+
A) Freely available materials			
a) Local Environment:			
1. Plant	1. counting frames: abacus	PS + E	T + P
1.1 bamboo	2. mats, display boards	PS + E	T + C
1.2 seeds and fruits	3. holders	PS + E	T + P + C
1.3 weeds and grass	4. lettering instruments	PS + E + S	T + C
1.4 leaves, flowers, roots and stems and barks of trees	5. containers	PS + E	T + P
	6. musical instruments	PS + E + S	T + C
	7. figurines, models, masks, puppets	PS + E	T + P + C
	8. toys and games	PS + E	T + P + C
	9. simple science apparatus scales, balances, counters	E + S	T + P + C
1.5 rice husks and straw	10. specimens	PS + E + S	T + P + C
1.6 coconut parts: husks, shells, sheaves, etc.	11. diorama	PS + E	T + P
	12. stuffings of toys and puppets	PS + E	T + P
1.7 natural fibers	13. acquarium		
1.8 rattan, cane, nito	14. terraruim		
1.9 cotton			
2. Animal			
2.1 shells, corals	1. specimens	PS + E + S	P + T + C
2.2 insects	2. figurines and models	PS + E	P + T + C
2.3 small animals: frog, fish, rabbits	3. toys and games	PS + E	P + T + C
	4. counting aids	PS + E	P + T + C
	5. lettering and coloring instruments	PS + E + S	T + C
	6. brush	PS + E + S	P + T

* PS = Pre-School
E = Elementary
S = Secondary
TE = Teacher Education

+ T = Teacher
P = Pupil
C = Community

Materials Classification	Application	Levels*	Mode of Production+
2.4 animal parts: hair, skin, horn, teeth skeleton, bones	7. mobiles and displays	PS + E + E	T + P + C
	8. musical instruments	PS + E + S	T + C
	9. weather measuring instruments: humidity indicators, wind vane	E + S	T
	10. containers	PS + E	T + P
	11. modules: science, social studies	PS + E + S	T
	12. acquirium		
	13. terrarium		
3. Mineral			
3.1 stones, pebbles	1. counting aids	PS + E	T + P
3.2 clay	2. specimens and objects	PS + E	T + P
3.3 sand, soil	3. models	E + S	T + P + C
3.4 limestone, marble	4. chemicals for laboratory experiments	S	T + C
3.5 salt	5. moulds for papier mache'	PS + E	T + C
3.6 oil and by products	6. toys and games	PS + E	T + P
3.7 gas	7. sand tray presentation	PS + E	T + P
3.8 iron filings			
3.9 liquid: water, soft drinks	8. sand paper	PS + E	T + P
	9. acquarium	PS + E	T + P
3.10 tin	10. terrarium	PS + E	T + P
	11. toys		
b) Waste Materials: (Scraps, Discards)			
1. Industrial Wastes			
1.1 empty containers	1. Laboratory activities	E + S + TE	T
1.2 scrap wood	2. figurines, models dolls, puppets, masks	PS + E	T + P + C
1.3 packing materials foam, polysterene, vinyle polyshene foil	3. counting devices	PS + E	T + P + C
	4. games and toys	PS + E	T + P + C
	5. electric bell	PS + E	T + P + C
1.4 cloth scraps	6. electric meter	E + S	T
1.5 used wires	7. funnel	E + S + TE	T
1.6 paper/glass/ plastic cups	8. coil bobbins	E + S	T
	9. spring balance	E + S	T
1.7 used electric wire	10. simple motor	E + S	T
	11. simple boat	E + S	T
1.8 posters	12. dynamic trolley	S + TE	T
1.9 advertisment materials	13. weather measuring instruments: rain gauge, wind vane	E + S	T

Materials Classification	Application	Levels*	Mode of Production+
1.10 discarded stationary	14. expansion apparatus	E + S	T
1.11 discarded parts from simple machines	15. spirit lamp	E + S	T
1.12 broken springs	16. battery holders	E + S	T
1.13 P + C tubes	17. simple switches	E + S	TP + C
1.14 disposable syringe needles	18. test tubes	S	TP + C
1.15 saline bottles regulators and tubes	19. burettes	S	TP + C
1.16 X' ray play	20. poster, flash cards, picture sheets, work cards, cut-outs	PS + E	T
1.17 sawdast	21. audio distribution system	E + S	T
1.18 newspapers and magazines	22. relief maps	E + S	T + P
1.19 fused bulbs	23. papier maché products	PS + E	T + P
1.20 bottle caps			
1.21 wooden crates			
1.22 carton boxes			
1.23 old hacksaw blades			
1.24 scrap films			
1.25 string, cords, threads			
2. Domestic Wastes			
2.1 used paper	1. posters, flash cards, picture sets, work cards, cut outs	PS + E	T + P
2.2 card boards	2. toys and games	PS + E	T + P
2.3 used clothing	3. puppets, masks	PS + E	T + P
2.4 newspaper, magazine books	4. papier maché articles	PS + E	T + P
2.5 bottle caps, lids and corks	5. study kit for: science, social studies, language home arts	S + E	T + C
2.6 postcards, greeting cards	6. magnifying glass	S + E	T
2.7 old calendars	7. counting devices (abacus)	S + E	T
2.8 used stamps	8. triple stand	PS + E	T + P
2.9 match boxes, cigarette boxes	9. dioramas	S + E	T
2.10 bags, envelopes	10. scrolls	PS + E	T + P + C
2.11 strings, twine, cord sewing threads	11. slides and transparencies	E + S	T
2.12 elastic material			

Materials Classification	Application	Levels*	Mode of* Production
2.13 bicycle tubes, tires and other parts			
2.14 ice-cream sticks			
2.15 empty spools and reels			
2.16 containers			
2.17 buttons			
2.18 used ball pens			
2.19 fused bulbs			
B) Accessible/Available at Little Cost Materials			
1. papers cardboards	1. display boards	PS + E + S	T
2. clips	2. charts, maps, posters	PS + E + S	T + C
3. nails, pins, needles, etc.	3. puppets, shadow plays	PS + E + S	T + P + C
4. glue, adhesives	4. toys and games	PS + E + S	T + P + C
5. buttons, fasteners	5. dioramas, models	PS + E + S	T + P + C
6. crayons, colouring materials, paints	6. modules	S	T
7. simple stationary materials	7. simple science instruments	S + E	T + P + C
8. candles and wax	8. slides and transparencies	S + E	TP + C
9. screws and bolts			
10. plywood			
11. plastic sheets and bags			
12. fabric materials			
13. gunny bags			
14. soft board			
15. rubber stoppers			
16. simple elastic materials			
17. pertex boards			
18. foams			
19. rubber sheets			
20. styro foam sheets			
21. simple toys			
22. toy motors			
23. puppets, dolls, masks			
24. magnets			
25. carton boxes			
26. egg caser			
27. crates			
28. simple electric wares			

Materials Classification	Application	Levels*	Mode of* Production
29. lettering guides, manuals and instruments 30. charcoal,coal 31. bamboo strips mats. 32. press studs 33. specimens, models 34. ping pong balls			
C)Prototype Materials for Large Scale Production and Distribution			
a) Graphic and Printed Materials			
1. maps, charts, posters 2. picture sets, cutouts 3. colouring books, pamphlets 4. overhead transparencies 5. filmstrips 6. slidesets 7. diplay/demonstration boards 8. card games 9. booklets, pamphlets, books.			
b) Three-Dimensional Materials			
1. do-it-yourself kits 2. electric bells 3. simple balances 4. measuring devices 5. magnifying glasses, lenses, mirror 6. plastic ware, glassware 7. simple toys and toy games 8. mini analyser 9. science kits.			
c) Audio Materials			
1. cassettes tapes 2. records 3. taped radio programmes			

Materials Classification	Application	Levels*	Mode of* Production
4. audio distribution system d) Audio-Visual Materials: 1. VTR 2. filmloops/ single concept films 3. movie films			